IMSCI'12

The 6th International Multi-Conference on Society, Cybernetics and Informatics

July 17th - 20th, 2012 – Orlando, Florida, USA

PROCEEDINGS

Post-Conference Edition

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Organized by

International Institute of Informatics and Systemics

Member of the International Federation for Systems Research (IFSR)

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ISBN-978-1-936338-73-3

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United States	10	22,22%

Foreword

Informatics and Cybernetics (communication and control) are having an increasing impact on societies and in the globalization process that is integrating them. Societies are trying to regulate this impact, and adapt it to their respective cultural infra-structures. Societies and cultures are in reciprocal co-adaptations with Information and Communication Technologies. Synergic relationships might emerge in this co-adaptation process by means of positive and negative feedback loops, as well as feedforward ones. This would make the whole larger than the sum of its parts, generating emergent properties in the parts involved as well as in the whole coming forth. The academic, private, and public sectors are integrating their activities; multi-disciplinary groups and inter-disciplinary teams are being formed, and collaborative research and development projects are being organized in order to facilitate and adequately orient the design and implementation of the feedback and the feedforward loops, and potentially generating synergic relationships. This phenomenon persuaded the Organizing Committee to organize the 6th International Multi-Conference on Society, Cybernetics and Informatics (IMSCI 2012) in a multi-disciplinary context along with other collocated events. Consequently, participants may focus on one discipline, while allowing them the possibility of attending conferences from other disciplines. This systemic approach stimulates cross-fertilization among different disciplines, inspiring scholars, originating new hypothesis, supporting production of innovations and generating analogical thinking.

IMSCI 2012 was organized and sponsored by the International Institute of Informatics and Systemics (IIIS, www.iiis.org), member of the International Federation of Systems Research (IFSR). The IIIS is a ***multi-disciplinary organization for inter-disciplinary communication and integration***, which includes about 4500 members. Consequently, a main purpose of the IIIS is to foster knowledge integration processes, interdisciplinary communication, and integration of academic activities. Based on 1) the transdisciplinartity of the systemic approach and its emphasis on *relationships* and *integrating* processes, and 2) the multi-disciplinary support of cybernetics' and informatics' concepts, notions, theories, technologies, and tools, the IIIS has been organizing multi-disciplinary conferences as a platform for fostering inter-disciplinary communication and knowledge integration processes.

Multi-disciplinary conferences are organized by the IIIS as support for both **intra-** and **inter-disciplinary** communication. Processes of intra-disciplinary communication are mainly achieved via traditional paper presentations in corresponding disciplines, while conversational sessions, regarding trans- and inter-disciplinary topics, are among the means used for inter-disciplinary communication. Intra- and inter-disciplinary communications might generate *co-regulative cybernetic loops*, via negative feedback, and *synergic* relationships, via positive feedback loops, in which both kinds of communications could increase their respective effectiveness. Figure 1 shows at least two cybernetic loops if intra- and inter-disciplinary are adequately related. A necessary condition for the effectiveness of Inter-disciplinary communication is an adequate level of **variety** regarding the participating disciplines. *Analogical thinking and learning processes* of disciplinarians depend on it; which in turn are potential sources of the creative tension required for cross-fertilization among disciplines and the generations of new hypothesis. An extended presentation regarding this issue can be found at www.iiis.org/MainPupose.

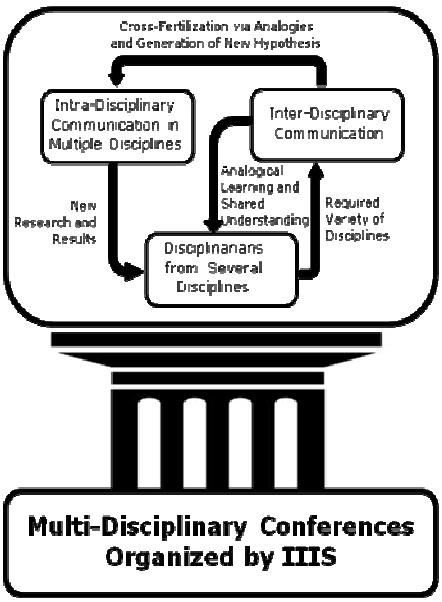

Figure 1

One of the main purposes of IMSCI 2012 is to bring together academics, professionals, and managers from the private and the public sectors, in order to share ideas, results of research, and innovative services or products, in a multi-disciplinary and multi-sector forum.

Educational technologies, socio-economic organizations, and socio-political processes are essential domains among those involved in the evolving co-adaptation and co-transformation between societies and cultures on the one hand, and between informatics and cybernetics (communication and control) on the other hand. Consequently, the main conference in the context of the IMSCI 2012 Multi-Conference is the 10th International Conference on Education and Information Systems, Technologies and Applications: EISTA 2012

The relationship between education/training and Information and Communication Technologies (ICT) is quickly intensifying and sometimes appears in unexpected forms and in combination with original ideas, innovative tools, methodologies, and synergies. Accordingly, the primary purpose of the 10th International Conference on Education and Information Systems, Technologies and Applications (EISTA 2012) has been to bring together researchers and practitioners from both areas together to support the emerging bridge between education/training and the ICT communities.

In the context of EISTA 2012, practitioners and consultants were invited to present case studies and innovative solutions. Corporations were invited to present education/training information systems and software-based solutions. Teachers and professors were invited to present case studies, specifically developed information systems, and innovative ideas and designs. Educational scientists and technologists were invited to present research or position papers on the impact and the future possibilities of ICT in educational systems, training processes, and methodologies. Managers of educational organizations and training consultants were invited to present problems that might be solved by ICT or solutions that might be improved by different approaches and designs in ICT.

EISTA 2012 provides a forum for the presentation of solutions and problems in the application of ICT in the fields of education/training. Authors of the papers included in the proceedings provided diverse answers to the following questions:

- What is the impact of ICT in education and training?
- How are ICTs affecting and improving education and training? What networks and models are emerging?
- How are universities, schools, corporations and other educational/training organizations making use of ICT?
- What electronic tools are there to facilitate e-learning, distance education and co-operative training?

On behalf of the Organizing Committees, I extend our heartfelt thanks to:

1. the 135 members of the Program Committees (28 members of the IMSCI 2011's PC and 107 members of the PCs related to the conferences and special tracks in the context of IMSCI 2011) from 35 countries;

2. the 232 additional reviewers, from 54 countries, for their **double-blind peer reviews**; and
3. the 109 reviewers, from 43 countries, for their efforts in making the **non-blind peer reviews**. (Some reviewers supported both: non-blind and double-blind reviewing for different submissions)

A total of 573 reviews made by 341 reviewers (who made at least one review) contributed to the quality achieved in IMSCI 2012. This means an average of 7.25 reviews per submission (75 submissions were received). ***Each registered author had access, via the conference web site, to the reviews that recommended the acceptance of their respective submissions***. Each registered author could also get information about: 1) the average of the reviewers evaluations according to 8 criteria, and the average of a global evaluation of his/her submission; and 2) the comments and the constructive feedback made by the reviewers, who recommended the acceptance of his/her submission, so the author would be able to improve the final version of the paper.

In the organizational process of IMSCI 2012, about 79 papers/abstracts were submitted. These pre-conference proceedings include about 45 papers, from 22 countries, that were accepted for presentation. I extend our thanks to the invited sessions and special tracks organizers for collecting, reviewing, and selecting the papers that will be presented in their respective sessions. The submissions were reviewed as carefully as time permitted; it is expected that most of them will appear in a more polished and complete form in scientific journals.
This information about IMSCI 2012 is summarized in the following table, along with the other collocated conferences:

Conference	# of submissions received	# of reviewers that made at least one review	# of reviews made	Average of reviews per reviewer	Average of reviews per submission	# of papers included in the proceedings	% of submissions included in the proceedings
WMSCI 2012	**258**	**822**	**1348**	**1.64**	**5.22**	**98**	**37.98%**
IMSCI 2012	**79**	**341**	**573**	**1.68**	**7.25**	**45**	**56.96%**
IMETI 2012	**88**	**388**	**705**	**1.82**	**8.01**	**35**	**39.77%**
CISCI 2012	**188**	**629**	**1283**	**2.04**	**6.82**	**61**	**32.45%**
TOTAL	**613**	**2180**	**3909**	**1.79**	**6.38**	**153**	**38.99%**

We also extend our gratitude to the co-editors of these proceedings for the hard work, energy and eagerness they shown preparing their respective sessions. We express our intense gratitude to Professor William Lesso for his wise and opportune tutoring, for his eternal energy, integrity, and continuous support and advice, as the Program Committee Chair of past conferences, and as Honorary President of WMSCI 2012, as well as for being a very caring old friend and intellectual father to many of us. We also extend our gratitude to Professor Belkis Sánchez, who brilliantly managed the organizing process.

We also express our immense gratitude to Professors Freddy Malpica, Friedrich Welsch, Jorge Baralt, Angel Oropeza, José Ferrer, Andrés Tremante, and José Vicente Carrasquero for chairing or co-chairing the respective Program Committees and/or Organizing

Committees. We also extend our gratitude to Professor Belkis Sánchez, for her relentless support in the organizing process.

We also extend our sincere gratefulness to Drs. Ranulph Glanville, Thomas Marlowe**,** Ruth Bergman, Karl H. Müller, Shigehiro Hashimoto, T. Grandon Gill, Marta White Szabo**,** Jeremy Horne, Mario Norbis, Susu Nousala, Richard Segall, Kathy Kovacs Burns, Rahul Bedi, Darshan Deseai, and Heidi Hahn for accepting to address the audience of the General Joint Plenary Sessions with keynote conferences.

We extend our gratitude as well to María Sánchez, Juan Manuel Pineda, Leonisol Callaos, Dalia Sánchez, Keyla Guédez, Nidimar Díaz, Bebzabeth García, Marcela Briceño, Cindi Padilla, Louis Barnes, Sean Barnes, José Aponte, Abrahan Marín, Yulaime Padilla, and Freddy Callaos for their knowledgeable effort in supporting the organizational process producing the hard copy and CD versions of the proceedings, developing and maintaining the software supporting the interactions of the authors with the reviewing process and the Organizing Committee, as well as for their support in the help desk and in the promotional process.

Professors Andrés Tremante and Nagib Callaos
IMSCI 2012 General Co-Chairs

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(Post-Conference Edition)

Society, Cybernetics and Informatics

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Enhancing Listening Proficiency via Multi-Modality Technology: A Study with Technology University Non-English Major EFL Learners in Central Taiwan

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ABSTRACT

This study concerns a multi-modality technology (MMT) intervention in a non-English major English as a foreign language (EFL) Listening and Speaking class (LS). Learners' progress was measured as they used the Interactive Response System (IRS) test practice instrument in class, and Pronunciation Power (PP), Active Reading (AR), and Sounds Good (SG) eLearning programs in the self-access center. A mixed method approach was adopted for data collection, and paradata such as students' PP learning log and SG unit reports were collected along with exam scores and attitude ratings, for triangulation purposes. A total of 207 students from three majors participated in the first study, and 138 students in a second study. Positive attitudes were detected from the satisfaction survey and corresponding improvements were recorded in exam grades. A significant difference in IRS satisfaction and exam results was identified among our three target groups with different majors, and effort put into eLearning practice in the self access center was observed to be a potential contributor to the distinction. The interpretation and pedagogical significance are discussed.

Keywords: IRS Test Practice, Multi-modality Technology, Listening Proficiency, Non-English Major EFL Learners.

1. INTRODUCTION

The lack of English proficiency in technology universities in Taiwan was demonstrated by a series of three annual national assessments, starting in 2001. The Language Training and Testing Center (LTTC) in Taipei was entrusted by the Ministry of Education (MOE) with the task of conducting a nationwide assessment using the General English Proficiency Test (GEPT) elementary level threshold. The reported pass rates in the elementary GEPT at 58 technology universities were only 1.123%, 1.416% and 2.026% [17]. In reference to the Common European Framework of Reference (CEFR), the elementary level of GEPT is equivalent to the Key English Test (KET) level of the Cambridge Main Suite, the 115-135 level of the Computer (CBT) TOEFL, the 3.0-4.0 level of IELTS, and 400-450 level of TOEIC. Despite efforts to promote English as a second language in local curricula, seriously low listening proficiency in particular was again diagnosed in the technology universities in 2011 when TOEIC listening results fell behind those of normal universities with mean scores of 248 versus 318 [6].

Yu [19] analyzed the gap between the general and technology university system in Taiwan and attributed the reason to teaching hour discrepancies in the curriculum. Indeed a large gap does exist between the numbers of hours of English taught in these two systems. The former system provides five to six hours of English instruction per week, while the latter only three to four hours per week. Furthermore, the general universities admit students mainly from general (comprehensive) high schools, but technology university students come mainly from technology (vocational) schools. As a result, the general university system receives students with a better English proficiency compared to the technology system. Besides that, You [18] reported low vocabulary sizes, which often lower Taiwan's technology students' reading and listening ability. It is estimated that Taiwan's technology students' vocabulary is limited to 2,000 high frequency words when normally a minimum of 10,000 vocabulary words are required to become a fluent reader of English textbooks, not to mention that effective listening requires broader rhyme, stress, intonation and pragmatic skills. Furthermore, subtle differences in the meanings of words have never been easy to discriminate for those who are not well-versed in English, especially our EFL learners. The conclusion is the pedagogical dilemma, noted by Chwo, Shih and Tso [4], that the lack of English proficiency on graduation from secondary school has left teachers at the technology colleges inevitably teaching students with a wide range of skill sets and low English proficiencies.

Other factors that might affect listening proficiency have been identified by Chwo [1], who demonstrated the potential English as a Foreign Language (EFL) versus English as a Second Language (ESL) effect with respect to language fluency and accuracy. Chwo observed a generally faster response time of college learners in time-controlled tests in Hong Kong's ESL educational setting compared to the EFL educational setting in Taiwan. Therefore, when designing language practice pedagogy, the speed element should be taken into consideration and an appropriate method should be utilized to enhance processing with speed as well as accuracy.

Given the above results and concerns, reform promoting language proficiency for our technology university EFL learners becomes urgent. Thankfully, with the advance of educational technology and an official mandate from the MOE urging schools to promote eLearning, an opportunity has presented itself to revolutionize educational practice. Indeed, Chwo et al. [4] reported significant progress from a technology university by implementing eLearning as an effective supplementary tool to remediate and promote students' language proficiency. This benefit was also reported by a minority of special needs students.

In order to further explore the feasibility and benefits of the new eLearning pedagogy, we decided in the present study to implement not just one kind of eLearning support but a multi-modality technology (MMT) intervention to see how it can be utilized to promote EFL learners' listening in our non-English major technology university classroom context. In essence we addressed the real time response speed issue mentioned above with the use in class of an Interactive Response System (IRS),

and the vocabulary size and lack of class time issues mentioned above by making available three software packages in the self-access center, as we now describe.

2. IMPLEMENTING MMT IN THE EFL NON-ENGLISH MAJOR CLASSROOM

Listening and Speaking (LS) is a required course for non-English major sophomore students, instructed on a two lesson per week basis in an assigned language lab or classroom. The textbook and teaching package were selected by the teaching staff of the Applied English Department through the voting procedure of the departmental meeting, following presentations by participating publishers. As a result, *Sounds Good* [5] was chosen as the sophomore textbook. The teaching package includes a CD, unit tests and supplementary teaching materials such as PPT and the Sounds Good eLearning program (SG). Standard assessment for the course comprises 20% in-class grading, 20% week 15-16 GEPT listening test, 30% mid and 30% final examination. Speaking proficiency was assessed separately via midterm and final dialogue role play tests providing a scenario for the EFL learners to create their own conversation using the target vocabulary and sentential expressions acquired in the lesson time. Not only can they recycle the vocabulary in a meaningful context, but also act out the scenes that are cross cultural for pragmatic purposes.

The weekly teaching unit follows the guideline of the sophomore coordinator's syllabus. In order to enhance the LS program with MMT, along with the SG support program, the researcher adopted Pronunciation Power (PP) software from the self-access center, the IRS test practice system, and (with one class in the first term only) Active Reading (AR) (see Table 1).

All four of these MMT features were integrated into the LS course in order to remediate and enhance the LS proficiency of our EFL learners. However, IRS is specifically focused on here because of its synchronous nature, simulating the time pressure of real listening, and the fact that it was used during the lesson rather than as outside support.

Vocabulary was pretaught at the beginning of each lesson using prefixes, suffixes or a word scramble game before hearing the listening text. Parts of speech were also introduced to extend students' knowledge about the word family. Vocabulary quizzes on spelling, parts of speech, and L1 translation were given before and after each unit to ensure that the students acquired the basic vocabulary for the target unit content. Movie appreciation during the Easter and Christmas season was also incorporated into the lesson to enrich students' language learning experience with cultural literacy. Afterthought comments were elicited to encourage reflection on the language, and cultural or personal issues inspired by the movie in the language learning context, thus students were exposed to cultural literacy besides vocabulary and language input. Speaking was also practiced along with listening, but our focus here is on the latter.

The novel element in the classroom was the use of IRS to deliver the practice vocabulary and listening comprehension items for each unit (though not for the listening assessment of the course), in place of the usual paper and pencil practice. IRS, sometimes called Classroom Response System (CRS), has been widely used in more than 1,000 universities in U.S.A. such as Harvard and Brown, but use in Taiwan in class instruction is only in its infancy. Most application is still limited to elementary and junior high school level. Research shows that IRS promotes not only active response and concentration, but also motivation. Significant results have been obtained in biology, chemistry, science, and math learning in Japan and Taiwan [7-16]. Until now, however, the implementation of IRS in language practice at university level has not been attempted as an effective practice tool in the classroom setting [3].

Table 1: Multi-modality technology implemented in the study.

Pronunciation Power (PP) PP is asynchronous software from English Computerized Learning Inc. of #208, 5405 – 99th Street, Edmonton, Alberta, Canada T6E 3N8. It contains eight English dictionaries to improve English pronunciation, 120 hours of listening practice, and simulation lessons to enhance learners' stress, timing, articulation, intonation and rhythm (S.T.A.I.R) skills. It also includes 7,000 vocabulary items, thousands of sentence practice items, 100 hours of lesson drills, 2,000 photos and illustrations, and 4 interactive games. It targets elementary and intermediate level learners with 12 ancillary language translations, which include simplified and traditional Chinese characters, French, German, Japanese, Korean, Portuguese, Polish, Russia, Spanish and Vietnamese.
Interactive Response System (IRS) The IRS system [7-15] is a synchronous interactive response system, which can be used to design time controlled listening and reading practice and tests which elicit a response within a set time. The accuracy rate for each test item, together with individual participant's score is recorded by IRS.
Active Reading (AR) AR is an asynchronous eLearning program provided by Winhoe publisher Wan Wo Co., Ltd. of 40760, Taichung, Taiwan. It aims to enhance the four language skills with six levels of graded practice lessons and a follow-up practice record tracing function to update instructors with students' recent progress. 50 free accounts were offered for a six month period to try out its effect on learning outcomes. Oral practice and recording are available for students to rehearse their speaking and listening skills besides reading diverse texts.
Sounds Good (SG) The eLearning program SG is an asynchronous eLearning program provided by the *Sounds Good* textbook publisher Dong-Hua (aka Tunghua) of No. 77, Section 1, Chongqing South Road, Jhongjheng District, Taipei City, Taiwan. It aims to assist content based listening skills. It serves as a useful extension learning tool after class time and encourages students to review the lesson at their own pace, is non-threatening and has repetitive modality.

To encourage autonomous learning (Chwo [2]) outside of class, an orientation lesson was arranged in the self-access learning center at the beginning of the term to familiarize the students with the software available to enhance their listening, pronunciation and speaking skills. PP was specifically introduced and practiced in pairs under the supervision of the instructor. An individual report was elicited from each student to show what they learnt and how they benefited from PP. The

SG eLearning program which complements the textbook and CD materials has no tracking system available for the instructor to monitor students' practice record, so each practice unit was required to be submitted in print with students' practice note or reflection as part of the homework assessment. Students were encouraged to practice as many times as they wished to remediate their LS skills at their own pace. The purpose of this part of the MMT intervention was to help recycle vocabulary and review lesson content in order to improve listening ability by increasing the frequency of exposure to the relevant listening exercise, its vocabulary, useful phrases and dialogue features. By scaffolding students' LS with MMT to supplement the two lessons per week of in-class instruction, it is hoped that the students are well supported with eLearning opportunities after class time so their LS proficiency can be maximized on an individual basis. Regarding speaking fluency practice, only PP and AR provided a recording function that enables students to practice their intonation, stress and articulation.

The IRS test practice for each unit was based on the textbook CD. The first and second sections are cloze tests of the unit vocabulary definitions and vocabulary comprehension in a sentential context, and the third section is a multiple choice listening comprehension test (no reading text was provided). A teaching assistant was sponsored by the Teaching Resource Center to assist in converting the unit test into IRS format. Different from the traditional paper and pencil test, IRS is a time controlled test where each test item was constrained by a set time and presented in strict sequence. Therefore, students were required to respond to one test item at once within a set time. Several adjustments were made based on the first term's experience to ensure a reasonable time was set for our EFL sophomore learners. An instruction section (with no time limit) was also added to inform students about the format, procedure and the number of items in each practice test so students would be well prepared to respond.

Each time IRS was used, following the students hearing the listening text of the current unit played once on CD, the instructor firstly allocated a remote control to each individual student according to their student number and waited for the whole class to get ready before she started to run the IRS test practice. After the IRS practice, the instructor displayed the results of IRS to the class showing the accuracy rate of each learner. Percentage accuracy for each practice item was also presented in a bar chart to inform students of the difficulty level of each item for the class overall. The instructor emphasized to the class that IRS test practice would not count towards their grade but constituted practice to improve their listening speed and accuracy. Any student with a higher score was acknowledged and nominated as class tutor to help those struggling in the class.

3. RESEARCH QUESTIONS

1) What are the non-English major students' attitudes to IRS test practice implemented in their English LS class?
2) Is there any significant difference in preference for use of IRS between three groups with different majors?
3) Is there any significant difference between the EFL majors in their mid and final exam results in each term?
4) Do students' exam results correlate with their scores on the IRS practice tests?

4. METHODOLOGY

Participants

Three non-English major sophomore classes taking the LS course participated in the first term study: Child Care (CC), Nursing (NN) and Environmental Industry (EI). The second term study included 95 students from the CC and NN class in the IRS practice experiment group, and 43 students from the EI class as the control group. Including only valid surveys with all items answered and those who took part in all IRS test practice units, we have 115 first study IRS surveys, 92 second study IRS surveys, together with 138 IRS practice records in the first study and 95 in the second.

Instruments and Procedure

Three classes received instruction from the same instructor throughout the academic year. In the first term study the IRS system was used in class with all three classes, followed by administration of an anonymized IRS survey designed by the Teaching Resource Center to elicit students' general impression of IRS practice. eLearning practice was promoted in the self-access center using PP and SG with unit homework collected for the latter from all three classes for grading. The AR eLearning program was exclusively used by the EI class in the first term. In the second term, CC and NN were selected as the experimental group (EG) to continue the IRS practice, while EI served as control group (CG) without IRS. Again at the end there was an IRS survey (where we report all responses without excluding repeaters or transfers). Cronbach's Alpha for the first survey is .921 and for the second .903, showing high internal reliability.

Both mid and final exam scores were collected in both terms from all classes so as to be able to gauge the IRS effect that might contribute to our EFL students' language learning outcomes as a result of MMT. Additionally, PP learning logs and SG unit homework reports were also collected to investigate the instructional effect of use of the self-access center besides IRS practice in class. Students were also required to reflect on their learning in a learning log to report their general impression of the practice at the end of the first and second term so that the instructor could be informed of the individual student's preferences concerning the software, and in what way the students were benefiting from its use.

5. RESULTS

Table 2: The means and standard deviations of the satisfaction ratings of each major with the use of IRS in the first term survey.

	NN		CC		EI	
Item	Mean	SD	Mean	SD	Mean	SD
Total	44.42	7.56	46.88	5.27	49.46	6.35
#1	4.14	0.78	4.32	0.52	4.33	0.77
#2	4.10	0.88	4.36	0.68	4.41	0.59
#3	4.14	0.72	4.20	0.59	4.32	0.80
#4	4.04	0.94	4.27	0.69	4.23	0.87
#5	3.98	0.95	4.22	0.74	4.18	0.88
#6	3.92	1.04	4.04	1.13	3.56	1.45
#7	3.84	0.88	4.13	0.76	4.23	0.90
#8	4.12	0.77	4.31	0.67	4.23	0.90
#9	3.90	0.83	4.16	0.77	4.10	0.94
#10	4.06	0.84	4.40	0.54	4.49	0.69
#11	4.14	0.84	4.43	0.73	4.62	0.57

Table 3: The means and standard deviations of the satisfaction ratings of each major with the use of IRS in the second term survey.

	NN		CC	
Item	Mean	SD	Mean	SD
Total	46.13	7.49	42.33	4.87
#1	4.15	0.89	3.91	0.51
#2	4.24	0.79	3.85	0.63
#3	4.20	0.72	3.78	0.59
#4	3.98	0.83	3.76	0.67
#5	4.09	0.84	3.67	0.73
#6	3.98	1.11	4.00	0.82
#7	4.15	0.87	3.65	0.60
#8	4.30	0.96	3.93	0.49
#9	4.11	1.12	3.70	0.70
#10	4.43	1.17	4.04	0.59
#11	4.50	1.22	4.02	0.58

Tables 2 and 3 show that the degree of satisfaction with the use of IRS maintains an average level of 4 on a 5 point scale, indicating an overall high degree of satisfaction with its use from all non-English major learners who used it in our first and second study. Though surveys showed that students considered the purchase of IRS system by the university might be too costly (item 6), students' reported concentration and motivation were not the least affected by this perception. Thus, our first research question was positively answered.

Table 4: ANOVA analysis of the difference in the degree of satisfaction with IRS between the different majors who used it in the first and second term study.

Survey	df	Mean square	F	p	Paired tests
First	2	211.7	4.96	.009	NN<EI
	112	42.7			
Second	1	332.9	8.34	.005	CC<NN
	90	39.9			

As seen in Table 4, a significant difference was found among the three groups in the first term in overall impression of IRS. Scheffe analysis reveals that EI rated IRS significantly higher than NN. Regarding the second survey results, NN was significantly higher than CC ($F=8.342$, $p<0.05$). Thus, there are significant differences in our survey outcomes among the three majors (research question 2).

Table 5: Descriptive statistics for the different majors in LS course exam results.

Exam	Major	Mean	SD
First term final	NN	64.04	12.34
	CC	63.28	13.19
	EI	64.63	11.08
Second term mid	NN	58.52	14.23
	CC	76.60	8.30
	EI	72.28	8.58
Second term final	NN	70.17	13.58
	CC	77.47	6.25
	EI	72.14	12.46

Based on Tables 5 and 6, there was no significant difference among the three target groups regarding their first term final exam results. However, significant differences were found in the second term. Scheffe analysis reveals that CC and EI were significantly higher than NN in their second term mid results while CC was significantly higher than NN in the second term final results. This shows that CC in EG with EI in CG stay as the top groups, while NN in EG remains at the bottom.

Table 6: ANOVA analysis of the difference between the different majors in LS course exam results.

Exam	df	Mean square	F	p	Paired tests
First term final	2	20.7	0.14	.872	
	135	150.5			
Second term mid	2	4222.4	36.11	<.001	NN<CC NN<EI
	135	116.9			
Second term final	2	672.8	5.35	.006	NN<CC
	135	125.8			

Table 7: Difference between NN's and CC's quizzes and exam results in the first and second term.

Exam/quiz	Major	Mean	SD	t	p
First final	NN	63.90	12.90	0.254	.800
	CC	63.17	13.50		
Second mid	NN	59.10	13.26	-7.216	<.001
	CC	76.50	8.02		
Second final	NN	70.10	13.54	-0.411	.682
	CC	71.23	11.40		
unit8	NN	79.68	11.87	3.823	<.001
	CC	66.48	18.89		
unit9	NN	66.46	10.90	4.767	<.001
	CC	51.26	17.47		
unit10	NN	65.68	15.81	3.335	.001
	CC	54.07	15.90		
unit11	NN	66.00	18.71	1.783	.079
	CC	59.76	12.46		
unit12	NN	79.71	10.22	1.369	.175
	CC	75.81	15.28		

According to Table 7, CC's second term midterm exam mean is significantly higher than NN's, though NN'S IRS practice results on units 8, 9 and 10 are significantly higher than CC's. The reason why CC outperformed NN on the exam could be contributed to factors other than IRS practice so the SG eLearning report and PP learning log were explored to examine the cause (research question 3).

Table 8: Correlations between IRS test practice results for units of the course and mid/final exam grades in the first and second term (* = significant at $p<.05$).

Major	Exam	unit8	unit9	unit10	unit11	unit12
NN with CC	1st final	0.376*	0.331*	0.447*	0.327*	0.272*
	2nd mid	0.005	0.010	0.044	-0.017	0.177
	2nd final	0.129	0.321*	0.343*	0.124	0.282*
NN	1st final	0.277	0.326*	0.580*	0.159	0.312*
	2nd mid	0.200	0.472*	0.448*	0.137	0.306
	2nd final	0.360*	0.498*	0.426*	-0.022	0.362*
CC	1st final	0.480*	0.391*	0.362*	0.585*	0.251
	2nd mid	0.143	0.360*	0.313*	0.137	0.303
	2nd final	0.418*	0.423*	0.281	0.529*	0.419*

Based on Table 8, an IRS practice effect was located among some units' results in relation to the EFL learners' exam outcomes, to a greater extent for final exams. In other words, the correlations support the idea that IRS practice helps a student to do better on the course exams (research question 4).

6. DISCUSSION AND SUGGESTIONS FOR PEDAGOGICAL IMPLEMENTATION

The overall results indicate that our EFL non-English college learners were satisfied with the innovative IRS test practice instrument, as positive results were received from the attitude surveys. Furthermore, there were widespread correlations between performance on IRS practice tests and course final exam scores. These findings attest the success of the intervention.

Further analysis however showed that significant differences in both attitude and performance exist among our three target groups. Here some other factors were found to be at work. First, EI displayed the highest IRS satisfaction results and outperformed NN during the first term. Then, despite in the second term being the control group not benefiting from IRS, they did not perform significantly worse than the experimental group on exam grades in that term. Could it be the case that AR served as an effective supplementary tool for EI, promoting learning alongside IRS practice?

On the other hand, a lower satisfaction rating was found for CC than NN in the second term, but CC obtained higher exam grades. In this case the researcher noticed a marked difference in the SG eLearning reports of CC students and suspected that it might contribute to their learning outcomes besides IRS effect. According to the SG homework, great effort was made by CC students: not only did they write out the whole listening conversation text, but also worked on vocabulary and sentence translation to achieve better comprehension of the text. Summaries of short paragraphs and descriptions of gist also appeared in their homework. Furthermore, some students even consciously monitored their progress with comments such as "I found myself making much more progress than last time!", "I found tremendous benefits by repetitive listening practice from the eLearning program."

Compared to the traditional classroom setting, eLearning appears to serve as an effective tool to provide unlimited interactive and repetitive listening opportunities for our non-English major students providing ample input outside of classroom time. This meets the needs of our EFL students who have very limited chances to speak to foreigners in their daily life or exposure to authentic input compared to ESL countries. It appears that the students benefited tremendously from the eLearning program, which consolidated and maximized their listening proficiency both in class with IRS and after classroom time using PP and SG and (where available) AR.

The effect of eLearning in the framework of MMT can be further investigated and integrated into language programs to scaffold non-English majors' language learning and remediate or upgrade their learning outcomes to achieve global competitiveness. However, factors such as class attendance might also affect the IRS practice routine. According to the instructor's report, different groups of students in the NN class were several times late or absent from the class due to a special meeting with their class mentor even though the instructor had informed the class mentor about the inconvenience caused by a meeting during her course session. This absentee data was not able to be amended and therefore, IRS data collection was affected by the absentee rate during these periods. This is an unexpected factor that must have affected the outcome of the study.

Further possibilities can also be pointed out prompted by the limitations of this study. Firstly, though the students were satisfied with the IRS provision of immediate feedback on their practice outcome, still there are several further program functions available for exploration, i.e. team competition and elimination tournaments, etc. How to extend the IRS practice to create dynamic and constructive team work or cooperative learning in the classroom setting can be explored. Thus, further experiments should include other IRS functions to promote learning outcomes which may enhance concentration and motivation for language courses either at the individual or cooperative learning level. Secondly, more English courses can be involved in the implementation of MMT to experiment on the feasibility of IRS, together with out of class use of synchronous or asynchronous eLearning programs, so as to enhance and sustain learning. Orientation meetings or training programs can be provided to equip and encourage instructors to implement MMT in their language courses to improve learning outcomes. Support from the school administration is another crucial factor in the successful application of MMT to courses. Only with the assistance of a well-trained teacher assistant delegated from the Teaching Resource Center was the instructor able to integrate the IRS practice system into the course instruction on a regular basis. Further experiments or trials are required to explore MMT in the non-English major LS course, or even extend to other language programs such as reading or writing.

Finally, in a study with a limited number of participants in a technology university, positive feedback was nevertheless received from our three target groups. Though the contrasting groups of majors did not offer straightforward results, with encouraging findings from the survey and exam results, further study should include the IRS system and related eLearning programs to confirm the effectiveness of MMT in the overall language learning program so that significant benefits can be identified for the promotion of the English proficiency of technology university non-English major learners.

7. ACKNOWLEDGEMENTS

This project was made possible by the generous sponsorship of Dong-Hua publisher and Winhoe language learning provider with a free trial of 50 accounts of Active Reading Software for a six month period, together with the provision of Pronunciation Power software in the self-access center. Thanks also must go to our Teaching Resource Center for their constant support with an updated teaching technology facility and teaching assistant so a potential instruction effect could be identified to improve teaching quality for the benefit of our students.

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Characteristics Required for A Teacher in Higher Education from the Viewpoint of Visual Arts

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Abstract

In order to face the rapid transformation and complexity of information technology and to survive in the global world, teachers play an important role in this situation. Teachers are already challenged with assuming full responsibility of classroom management and teaching methodology at the commencement of their careers. The academic disciplines of political science and education can draw from the fields of public administration, public policy, international relations, global economic policy, computer technology, campaign management, higher education administration, and progressive education. In the process of finding their place in college environment, teachers build and develop their professional identity. The visual arts are art forms that create works which are primarily visual in nature, such as ceramics, drawing, painting, sculpture, architecture, printmaking, modern visual arts (photography, video, and filmmaking), design and crafts. The main purpose of this paper is to discuss and analyze, from the viewpoint of visual arts, the characteristics required for a teacher in higher education. This research mainly explores the characteristics required for a teacher in higher education, especially for professional knowledge and technology development, the awareness of organizational climate and global perspective.

Keyword: professional knowledge and technology development; the awareness of organizational climate; global perspective

Introduction

Over the past few years, the educational environment was rapidly changing because of the reduction of new-born baby; the structure of family resulted from new immigrants; the economic recession resulted from global financial storm and the vacillating educational policy. These reason will influence the operational way of most schools; especially, private schools. The characteristics of teachers in higher education will catch up with the change. This paper will apply a new viewpoint of visual arts to discuss the characteristics required for a teacher in higher education. The visual arts are art forms that create works which are primarily visual in nature; in addition, the definition should not be taken too strictly as many artistic disciplines (performing arts, conceptual art, textile arts) involve aspects of the visual arts as well as arts of other types. Also included within the visual arts are the applied arts such as industrial design, graphic design, fashion design, interior design and decorative art. In addition, visual art can apply creativity that refers to the phenomenon whereby a person creates something new (a product, a solution, a work of art etc.) that has some kind of value. Blase(1991) pointed that individual and sub-groups will use formal and informal power and political behavior to achieve the goal in the organization. Moreover, the members of organization need consider the interests, needs, value and ideology which are inextricably connected to reach the target of organization. In order to achieve objectives, the members of organization can use strategies and skills of visual arts to create,

maintain or fight with their profits and the conditions of work. (Kelchtermans, 1996; Kelchtermans & Ballet, 2002) Hsin-Jen Chen (2007) points that the members of the school organization come from different backgrounds, and they use different values, judgments, beliefs and ideologies to deal with educational affairs. In addition, the members usually use the ways that are consultation, negotiation and coalitions to obtain the power and to protect the benefits. Higher education refers to a level of education that is provided by universities, vocational universities, community colleges, liberal arts colleges, institutes of technology and other collegiate level institutions, such as vocational schools, trade schools and career colleges, that award academic degrees or professional certifications. The principal will set up some strict rules and standard to trim and streamline the scale of school including faculty and equipment to continue exist. The challenge of the teacher turns to be heavier and heavier than before. The teachers of college need make progress for themselves to survive in this competitive educational environment under the rapidly change. Accordingly, the responsibility for the teacher is not only teaching knowledge but also enlarging their critical ability and skill to meet the demands of college. This research mainly explores the characteristics required for the teacher in higher education from the viewpoint of visual art, especially for the characteristic of professional knowledge and technology development, the awareness of organizational climate and global perspective.

Characteristics Required for a Teacher in Higher Education from the Viewpoint of Visual Arts

Traditionally, the responsibility for the teacher is to propagate doctrine, to teach the student and to solve the students' problem. Time changes, the society become complex and multiple. Teacher training program has to consider different aspects to train the future teacher facing this changeable society. In order to adapt in the need of educational environment, the characteristics required for the teacher in higher education the viewpoint of visual arts are professional knowledge and technology development, the awareness of organizational climate and global perspective.

I. Professional knowledge and technology development

The University provides a competitive and learning environment for students, to better prepare them to compete with the elites around the world. Moreover, these schools will require the faculty such as the teachers for make progress in their skills of teaching and the ability of research. Therefore, the teachers need to advance their professional knowledge and technology development in the field of their major that make use of new technical facilities. Under the pressure of making progress, this research will discuss the characteristic, professional knowledge and technology development, required for the teacher in higher education from the viewpoint of visual arts.

Professional development (Speck, 2005) refers to skills and knowledge attained for both personal development and career advancement. Professional development encompasses all types of facilitated learning opportunities, ranging from college degrees to formal coursework, conferences and informal learning opportunities situated in practice. It has been described as intensive and collaborative, ideally incorporating an evaluative stage. There are a variety of approaches to professional development, including consultation, coaching, communities of practice, lesson study, mentoring, reflective supervision and technical assistance. In addition, there are many opportunities for teachers to continue to develop skills and knowledge required for rapidly changing educational environments. The visual arts are distinguished from the performing arts, language arts,

culinary arts and other such classes of artwork, but those boundaries are not rigid. Many artistic endeavors combine aspects of visual arts with one or more non-visual art forms, such as music or spoken word.

Through engagement with a variety of professional knowledge and technology development opportunities, teachers have the opportunity to enhance their practice, support student learning and ensure high educational standards.

Golding (2006) believes that professional development comprises active and reflective engagement in a range of professional experiences that are considered supplementary to the day-to-day responsibilities of a teacher. The intent of professional development is to enhance the skills, knowledge and understandings of teachers in order to influence student learning outcomes. Some approaches to professional development include:

1. Consultation - to assist an individual or group of individuals to clarify and address immediate concerns by following a systematic problem-solving process.
2. Coaching - to enhance a person's competencies in a specific skill area by providing a process of observation, reflection, and action.
3. Communities of Practice - to improve professional practice by engaging in shared inquiry and learning with people who have a common goal
4. Lesson Study - to solve practical dilemmas related to intervention or instruction through participation with other professionals in systematically examining practice
5. Mentoring - to promote an individual's awareness and refinement of his or her own professional development by providing and recommending structured opportunities for reflection and observation
6. Reflective Supervision - to support, develop, and ultimately evaluate the performance of employees through a process of inquiry that encourages their understanding and articulation of the rationale for their own practices
7. Technical Assistance - to assist individuals and their organization to improve by offering resources and information, supporting networking and change efforts (NPDCI, 2008).

As for my own experience, I am an lecturer in an university. The director makes some momentous decision in order to reach the goal to become a creative and global university. The most important decision is he make a wish that every student when he graduate from the business college of this school. The student can learn the professional skill of digital marketing. Consequently, as to improving and retraining the professional development, the teachers in the business college need to learn the ability and skill of digital marketing before they teach the students. Professional knowledge and technology development is a crucial characteristic to maintain the position of teacher of the changeable educational environment in a rapid development. Accordingly, professional knowledge and technology development is an important characteristic required for a teacher in higher education from the viewpoint of visual art.

II. The awareness of organizational climate

Due to the difference of the faculty's backgrounds; hereafter, it is difficult to agglomerate the centripetal force and to accept the well-disciplined administration in order to run the college effectively. The school not only requires resourceful knowledge, but also relies heavily on creativity. Therefore, it is very important for the director and principal to awake and create the organizational climate of an university. As to managing a school, the principal should use strategies of innovative management to create the organizational culture of school. The principal has to form the entire facility and students; especially, the teacher, as a creative and organized cultural entity, in order

to advance school's performance and results, and dynamically adapt any change in the future. This paper will discuss the other characteristic, the awareness of organizational climate, required for the teacher in higher education from the viewpoint of visual art.

Schein (1992) defined culture formally: Culture is a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and; therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. Ali, D (1986) refers to organizational climate, or organizational culture, sometimes also called organizational ideology refers to a pervasive way of life and a set of norms. Haplin (1966) mentions that in organizations there are deep-set beliefs about the way should be organized, the way authority should be exercised, how people should be rewarded, and how they should be controlled. The culture of an organization can sometimes be visible in its building and its offices. It can be manifest in the kinds of people it employs, the kind of career aspirate.

From a traditional education point of view, education is neutral. It was separated from politic, culture, religion, etc. The responsibility of the teacher is to teach the students and to solve the students' problems. The faculty of an institute of technology pays less attention to the affairs of the school. The situation is totally different than before, the reduction of new born baby resulted in more difficult to recruit students. Therefore, the principal need declare the dilemma that the school suffered. Moreover, it is most important to awake and create the organizational culture of school for the principal. Maxine Greene (1978) emphasizes the idea of "wild-awakeness". Paulo Freire (2002) stresses the appeals of their "own conscience." The organizational culture of school initiate the teacher training program is not only teaches the skills and techniques of teaching but also emphasizes the importance of developing the centripetal force. Significantly, the future teachers can reflex their teaching and figure out the administration problems; and more than this, they have to be willing to innovate and be active to agglomerate and run the organizational culture of school. (Lin-Shin Tsai, 2000) For instance, the belief of the organizational culture is "safety" in Wu-Feng University. The faculty need obey this belief and create safety literacy curriculums which set up any new equipment to reach the goal.. To this extent, those teacher who posses the characteristic of awareness of organizational climate may pursue advanced knowledge and try to create and innovate. Henceforward, they may reflex their life and reconstruct or reform the school to be an anti-hegemony and emancipated world. Hence, the awareness of organizational climate is a critical characteristic required for a teacher in higher education from the viewpoint of visual arts.

III. Global perspective

Since the invention of the airplane diminishes the geographical distance between people, the information technologies break up the boundary between different nations and change the way of communication, economic activities between countries reinforce the opportunity to travel abroad; the idea of globalization seems to be the main stream in the 21st century. This paper will discuss another characteristic, global perspective, required for the teacher in higher education from the viewpoint of visual arts.

Global education has been the main trend in the 21st century. The objective of global education is to deepen the students' understanding in the complexity and value of multicultural society; and moreover, it intends to construct students' global perspective so that the student may adapt in the globalized

environment and contribute to construct a more equal and sustainable world. (Kao, 2002) Inder to raise the students' competitive capacity to compete with other country and adapt to the globalization trend, the ministry of education emphasizes the importance of internationalization in a university in the upcoming University Evaluation. Many Universities set a goal to expand the students' global vision so they can fit the requirements of MOE about Internationalization and globalization.

Hsun-Fan Kao quoted Hanvey's idea about global vision which contains five different aspects: consciousness, state of the planet awareness, cross perspective-cultural awareness, knowledge of global dynamics, and awareness of human choices. (Kao, 2002) From this point of view, global vision includes both internal and external facets in viewing the world, not only from personal point of view but also from the world's, even from the universe's point of view.

Besides, Ms. Ying-Tai Long argues that global vision should include humanitarian concerns for the world. She points out that when tsunami in the south sea happened, all people in the world devoted themselves to secure the people and help them; ironically, young people in Taiwan were celebrating the new coming year at the same time. The ignorance of concerning those who encountered big disaster in other countries somehow reveals the coldness of the young men in Taiwan. Probably the distance detracts the concern and care from those young men. In some aspects, it reveals the lack of global vision in young people in Taiwan. The teacher should pay more attention in this situation, they must teach the student to create their career plan or to judge by global perspective. From this perspective, global vision should include human concern to people in the world, and extensively, to the whole universe. As a future teacher should perceive and sense what is happening in the world and share the feeling. The scope of study and appreciation of visual arts spans the globe, and reaches through time back to people drawing on stone walls. All societies have embellished their tools and toys with more visual interest than is functionally necessary. More importantly, the educators should develop their global vision to respect the difference between different culture and individual opinion, to concern the issues about politic, economic, ecology, and the society, and to recognize the value of ourselves, the difference between our culture and others, and to deprive from bias and discrimination. Teachers have to participate in international activities to broaden our own world view and construct our global vision. Then, we can get rid of the geographical limitation of Taiwan to connect with the world and get involved in the global village to construct a better world. Thus, global perspective is a significant characteristic required for a teacher in higher education from the viewpoint of visual arts.

Conclusion

Under the viewpoint of visual arts, the power and conflict can transfer peacefully, the teachers play an important role in an institute of technology. When they find the educational environment has changed, the teachers have to face it and to develop themselves to adapt it. For instance, the crisis of financial resulted in the reduction rate of recruit students; especially in private school. The teacher want to keep their job, they can match up the requirements of the school such as reducing an annual bonus. In the other case, teacher training program is no longer limited in normal education system. It symbolizes an open, multiple, and progressive idea in education. In order to adapt in the multi-cultural and transitionary educational environment, highly development in information technology, and the form of global village, how to renew professional knowledge and technology development, to form or

create the organizational climate of the school and to build global perspective from viewpoint of visual arts in higher education is a big task for the teachers. In the other word, the characteristics required for the teacher in higher education from viewpoint of visual arts are professional knowledge and technology development, the awareness of organizational climate, and global perspective. Hence, how to encourage the teacher to bring up their professional knowledge and technology development, to understand the awareness of organizational climate, and to set up global perspective is a big task for the teacher training program. Aside from deepening the teachers' understanding in the complexity and value of multicultural educational environment, it intends to cultivate the teachers' professional knowledge and technology development to continue the position of teaching, to awake the awareness of organizational climate to run the school administration effectively, and to construct students' global perspective so that the teachers may adapt in the globalized educational environment and contribute to construct a more equal and sustainable world.

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On the Process towards Forming Key Competencies of University Students

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ABSTRACT

This paper presents research results of the pedagogical experiment comparing test scores in three subjects (Database Systems, Management, IT English) taught in the ICT-supported distance way or in the traditional present way at the Faculty of Informatics and Management, University of Hradec Kralove, Czech Republic. The received results are discussed from the point of cognitive and learning styles, mainly focusing on the suitability of e-learning to student´s individual learning style.

Keywords: ICT, key competencies, e-learning, learning style, English for Specific Purposes, Database systems, Management

1. INTRODUCTION

Modern information and communication technologies have penetrated the society, including the field of education, and brought crucial changes. The reflection of this process requires to be researched continuously and systematically in the whole breadth. This situation defines the research problem, this paper is dealing with. The instruction supported by the information and communication technologies (the ITC-supported instruction) may be understood in various ways. We paid attention to online courses running in the Learning Management System (LMS) WebCT and their influence on the process of instruction. It is generally accepted that all educational outcomes should result in forming key competencies which are defined as Four Pillars of Education [1] (learning to know, learning to do, learning to live together, learning to be). Based on these requirements the key competences were defined as the combination of knowledge, skills and attitudes appropriate to the context. They are particularly necessary for personal fulfilment and development, social inclusion, active citizenship and employment. This framework defines eight key competences (communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, cultural awareness and expression) which are all interdependent and the emphasis in each case is on critical thinking, creativity, initiative, problem solving, risk assessment, decision making and constructive management of feelings [2].

Resulting from the above mentioned the research was run at the Faculty of Informatics and Management (FIM) University of Hradec Kralove (UHK), Czech Republic, dealing with question whether there is any ICT contribution to the process, i.e. to increasing the university students knowledge which should result in developing their key competencies.

2. RESEARCH OBJECTIVES

The research focused on the influence of the way of instruction (ICT/LMS versus real teacher) on students´level of knowledge. The main objective was to compare the level of students´knowledge developed within the ICT-supported distance way of instruction to the traditional present face-to-face instruction and found out whether the ICT contribute to the process positively.
We expected that university students taught with the ICT support reach higher level of knowledge in comparison to those who are taught in the traditional way. The educational outcomes which are researched include students´ knowledge, skills and attitudes, and the process of instruction as the whole is the researched field. Developing and reaching the key competencies is a lifelong process which should provide students with "tools" to solve still unknown problems and become contributive to the society and successful on the labour market successfully.

3. RESEARCH HYPOTHESES

Resulting from the research problem the main hypothesis was defined as follows:

Students reach higher level of knowledge in the ICT-supported distance way of instruction in comparison to the traditional present way.

The research was held in three main subjects – Database Systems (DS). Management (M) and IT English (E), so the main hypothesis was structured into three partial ones:

H_1: Students of FIM UHK reach higher level of knowledge in the ICT-supported distance way of instruction in comparison to the traditional present way in the subject of Database Systems.

H_2: Students of FIM UHK reach higher level of knowledge in the ICT-supported distance way of instruction in comparison to the traditional present way in the subject of Management.

H_3: Students of FIM UHK reach higher level of knowledge in the ICT-supported distance way of instruction in comparison to the traditional present way in the subject of IT English.

4. RESEARCH METHOD AND TOOLS

The main method applied within the research was the pedagogical experiment, partially supported by observation and interviews in several cases if the need for additional data appeared. Didactic tests were used within the pedagogical experiment. It followed the "pretest – instruction – posttest" structure where the entrance level of respondents knowledge was detected by the pretests in each subject and the final knowledge was tested by posttests.

Two educational strategies were applied. The process of instruction was organized either in the ICT-supported distance way in the experimental groups, or in the present way in the control groups. Finally the collected data were statistically processed and results interpreted and discussed. The didactic tests were piloted, their results and changes were discussed within the departments, then the tests were adjusted according to the requirements and repiloted. All tasks proceeded from learning objectives and were based on appropriate taxonomies. The tasks in Database Systems arose from four levels of the Niemierko´s taxonomy [3]:
- Remember facts.
- Understand and organize facts.
- Apply knowledge to standard situations.
- Apply knowledge to a new situation.

The pretest contained 7 tasks, in posttest 15 tasks were solved.

The tasks in Management were constructed according to the Tollinger´taxonomy [4] using three categories:
- Remember and recall facts.
- Understand facts and prove the ability to apply them.
- Apply new knowledge in new problem situations.

The pretest contained 8 tasks, in posttest 12 tasks were solved.

The IT English tests were built on the Bloom´s taxonomy [5], [6] using three categories:
- Remember and recognize facts.
- Understand, i.e. summarize and interpret facts.
- Apply , i.e. implement and operate facts.

The pretest and posttest consisted of 32 tasks each.

The task characteristics were calculated for each item covering the difficulty, Upper-lower Index, Tetrachoric Coefficient, Point Biserial Coefficient, and the test reliability was set by the Kuder-Richardson formula (Eq. 1)

$$r_{kr} = \frac{k}{k-1}\left(1 - \frac{\sum pq}{s^2}\right) \tag{1}$$

where
k –number of tasks in test,
p –number of respondents who solved the task correctly,
q –number of respondents who did not solve the task correctly,
s – standard deviation of the whole test result.

The test validity was considered by the expert groups; all tests were recognized reliable and valid.
The collected data were processed by the NCSS2007 statistic software. The hypotheses were verified by the T-test and Mann-Whitney test.

5. RESEARCH SAMPLE

The research sample included students of bachelor study programme of Applied Informatics and master study programme of Information Management enrolled in the 2010/11 academic year in subjects of Database Systems, Management and IT English. All the subjects belong to compulsory ones taught in the first year (Management and IT English) and in the second year (Database Systems) of study. The experimental and control groups were formed by a random choice (i.e. by drawing lots to decide the group).

Totally 402 respondents were included in the research sample at the beginning of the experiment, 333 of them went through the whole experiment. Amounts of respondents are presented in table 1.

Table 1 Research Sample

	Pretest		Posttest	
	E	C	E	C
Database Systems	109	65	65	46
Management	35	37	32	34
IT English	90	66	90	66
Total in groups	234	168	187	146
TOTAL	402		333	

(E: experimental group, C: control group)

6. PROCESS OF INSTRUCTION

In experimental groups the process of instruction was organized in the ICT-supported distance way, i.e. after the starting tutorial at the beginning of the term respondents studied in the online courses for each subjects. The courses were designed in the virtual learning environment (WebCT) which was designed for the educational purposes, i.e. it provided all tools required for running the process efficiently. The courses underwent the accreditation by university experts in e-learning before first applied.

7. RESEARCH RESULTS

The null hypotheses were set as follows:
H_{01}/ H_{02}/ H_{03}: There is no statistically significant difference in test results in experimental and control groups in Database Systems / Management / IT English.

The collected data were processes by the NCSS2007 statistic software, applying the t-test and Z-test.

The test results are displayed in tables 2, 3 and 4.

Table 2 Test Results in Database Systems

	PreC	PreE	PostC	PostE
Mean	3.2	2.9	7.2	7.4
SD	1.49	1.57	1.88	1.77
Min	0	0	3	3
Max	6	6	10	10
Modus	3	3	6	9
Median	3	3	7	8
Norm	CNR	CNR	CNR	CNR
t	0.9936		0.5583	
Z	1.1666		-0.5098	
H01	Accept		Accept	

Table 3 Test Results in Management

	PreC	PreE	PostC	PostE
Mean	2.9	2.4	9.3	9.2
SD	1.98	1.54	2.48	2.56
Min	1	0	3	0
Max	5	5	14	13
Modus	3	2	10	-
Median	3	2	9.5	9
Norm	N	N	N	CRN
t	-1.2858		-2.2314	
Z	-1.3474		-0.1078	
H02	Accept		Accept	

Table 4 Test Results in IT English

	PreC	PreE	PostC	PostE
Mean	40.3	42.7	93.8	92.2
SD	2,5	2.3	3.3	3.1
Min	24	18	82	68
Max	57	61	103	112
Modus	-	29	-	96
Median	40	41	95	93
Norm	N	CRN	N	N
t	-0.9553		-1.2278	
Z	1.4449		0.8518	
H03	Accept		Accept	

(Pre: pretest, Post: posttest
E: experimental group, C: control group
Norm (normality test): N (normal distribution), CRN (cannot reject normality)

Proceeding from the above results the critical value Tcrit is 1,9866; all the calculated values Tcalcul are lower than the critical value, i.e. no statistically significant differences in experimental and control group performances were discovered. The null hypotheses H_1/ H_2/ H_3 were accepted.

Final comparison of test results in Database Systems, Management and IT English are presented in figures 1-3 below.

8. RESULTS DISCUSSIONS

Resulting from the research results we can state that students in the experimental group reached **the same test scores in the ICT-supported distance process** of instruction in memorizing, understanding, developing new knowledge and applying it in problem situations **as the students within the traditional present face-to-face process of instruction.** This proved the ICT contribution to the process of increasing university students knowledge and consequently to forming and developing their key competencies.

It should be emphasized the process of instruction was held by qualified teachers (tutors) with special training for running the ICT-supported distance form of instruction. The virtual learning environment WebCT is primarily designed for university (tertiary) education. It provides all tools necessary for simulating main phases of the instruction, i.e. motivation, explanation, fixation, evaluation, and managing the process in such a way which provides adequate conditions for learning, and thus contributes to forming and developing learners´ key competencies. Some preconditions are required before the process starts, the crucial question is whether both teachers and students are able to realize the potential of modern technologies and use it within the process of instruction. Having undergone the starting period of hesitation, material and technical problems, the time came to deal with didactic aspects of ICT implementation into the instructional process and following questions should be answered. First, are teachers able to apply suitable methods and forms of instruction, create and use appropriate didactic means which are offered by new technologies? Second, are the new didactic means able to optimize the cognitive process of creating knowledge? Despite the expected answers are yes to both questions, this does not mean all students are able to reach better results (higher test scores) when this approach is applied. The third problem could be defined as follows: does the ICT-supported process of instruction meet the individual needs of a student which relate to the individual learning style? Experience gained in the process of ICT implementation re-started discussions on the role of learning and teaching styles. They play important role especially under such conditions if the instruction is managed by a virtual learning environment. It offers designers a wide range of tools which accommodate all learning styles and students can choose those activities which suit them best. On the other hand, there exist several conflicting ideas concerning practical application of learning styles which should be taken into consideration.

The effectiveness of the educational process is given by such factors as learner's intelligence, prior knowledge, level of motivation, stress, self-confidence, and (last but not least) the learner's cognitive and learning style. It is generally acknowledged that the instructor's teaching style should match the students´ learning styles. Felder [7], [8] says that mismatching can cause a wide range of further educational problems. It favours certain students and discriminates others, especially if the mismatches are extreme. On the other hand, if the same teaching style is used repeatedly, students become bored. Gregorc [9] claims that only individuals with very strong preferences for one learning style do not study effectively, the others may be encouraged to develop new learning strategies. Only limited numbers of studies have demonstrated that students learn more effectively if their learning style is accommodated. Mitchell [10] concludes that making the educational process too specific to one user may restrict the others. But the possibility of individualization of the educational process from the both students´ and teachers´ point of view is its greatest advantage [11].

From the above presented it can be seen that it is important for a student to be aware of his/her learning style, know what his/her strengths and weaknesses are and be provided a variety of instructional methods to choose the most suitable ones. In the days of fast technical and technological development, globalization, demand for further, lifelong education, the importance of education is increasing. These terms and conditions support the development of the whole system. And teachers´ and students´ awareness of learning styles may help substantially.

9. CONCLUSION

Current orientation of university education, which is changing under the influence of latest technology development and new key competences, can be researched from various, different points of view. The ICT-supported instruction has been spreading because of growing popularity of modern technologies in general. Another reason is that this approach enables easier and more complex realization of the instructional process, offers choice of place, time and pace for studying, allows an individual approach to students preferring various learning styles. These are the key values important for the effectiveness of the process. Material and technical requirements having been satisfied, strong attention could be paid to didactic aspects of the instructional process. The main objective of project A flexible model of the ICT supported educational process reflecting individual learning styles" is to contribute to this process. Generally, motivation and engagement of both the learners and teachers within the process of learning and teaching may influence these processes and have strong impact on the research findings.

"If teachers are provided modern technologies only - it does not change the situation much, but it can start new activities and approaches. Bringing computers to schools is less important than providing teachers with new ideas. Technologies do not aim at removing traditional educational methods and forms. The new technologies do not automatically bring positive changes into the process of instruction but they may contribute to increasing its effectiveness, under some conditions" [12].

Acknowledgment

The paper is supported by the GA CR Project N. P407/10/0632.

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Test results in Database Systems are displayed in figure 1.

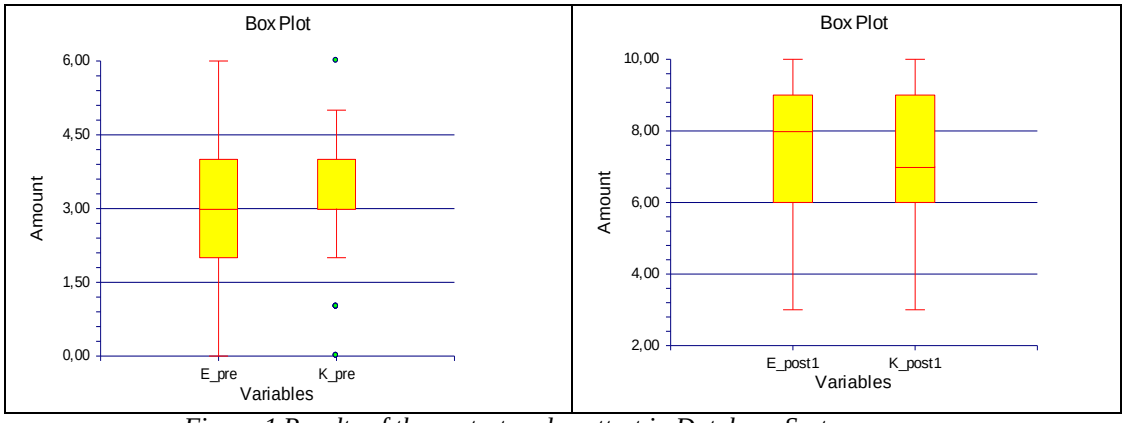

Figure 1 Results of the pretest and posttest in Database Systems

Test results in Management are presented in figure 2.

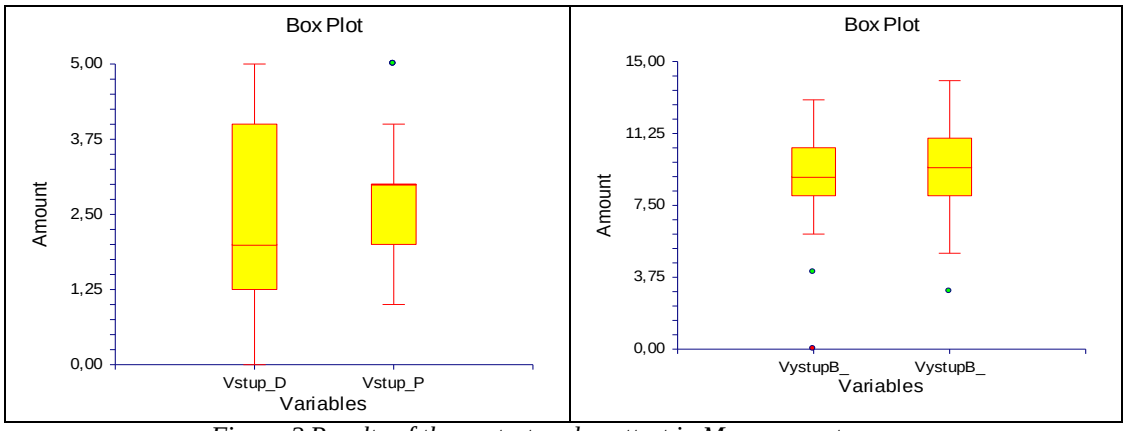

Figure 2 Results of the pretest and posttest in Management

Test results in IT English results are presented in figure 3.

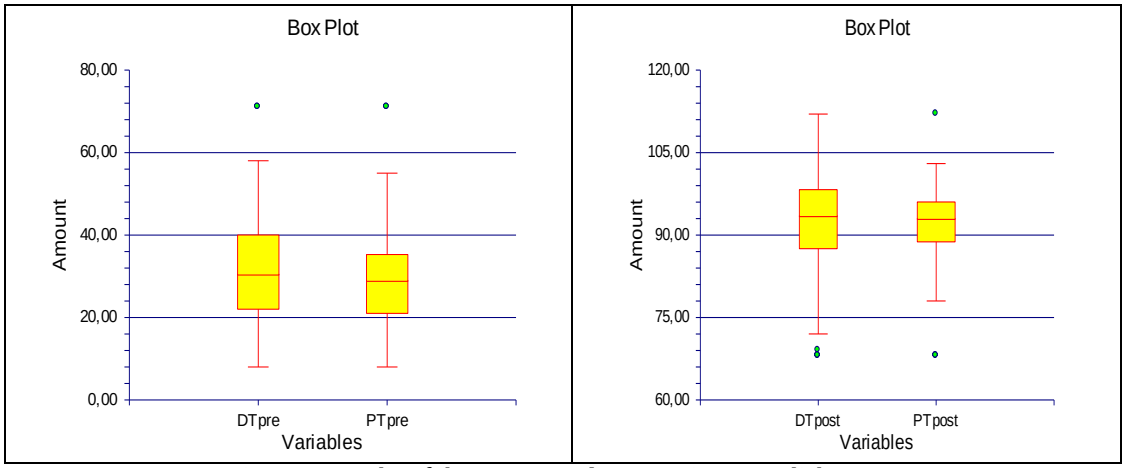

Figure 3 Results of the pretest and posttest in IT English

D: distance form of instruction, i.e. experimental groups
P: present form of instruction, i.e. control groups
E: experimental group, C: control group

Virtual Communities as a bridge between learning activities and the Information system

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***Abstract*—The paper presents our experience as designers, developers and administrators of an e-Learning system (LMS) that has been created "against the current" of standardization and "normalization" of LMS platforms, in our opinion too flattened over these pre-defined, pre-design software platforms. By adopting the metaphor of virtual communities as aggregation space for participants, thus supporting cooperative activities among users instead of just learning activities, our platform has been created to be adapted and connected to the information system of the organization. Considering e-learning and collaboration platforms as external bodies, relegated to secondary roles inside the information system, is in our opinion losing an excellent opportunity to improve collaboration and open innovation inside an organization. In this work we will describe the evolution of our virtual community platform towards being a component of any organization's information system. We will show why didactic and cooperative activities in an educational environment require coherent architectural choices in the software platform, in order to facilitate the integration of the learning platform into the existent information system.**

Keywords: e-learning; lifelong learning; collaboration; information systems

1. INTRODUCTION

This work is derived from our experience in e-learning settings, particularly related with the idea of an e-learning platform as a component of the Information System of any organization. We will introduce our experience in developing a software platform for the management of virtual communities, called "Online Communities", to be extensively used inside our projects that aim at developing an educational and collaborative environment, Specifically, our main activities in this direction have been oriented towards two different settings:

a) Students of our university, mainly coming from our Faculty of Economics but also from other faculties of the University of Trento: at the moment, we have approximately 16.000 users enrolled in 5.000 different virtual communities
b) public employees of our provincial administration (Autonomous Province of Trento - P.A.T.- Italy). The name of the project, L3-lifelong learning, is clearly identifying target and objectives of the initiative. In this case, we are talking about potentially 20.000 users. The system has been just recently opened to all the public institutions of our province, so at the moment we have approximately 5.000 users, that will surely increase in the very near future.

Both use cases have clearly demonstrated, in our opinion, the need of a tight integration between our virtual communities platform and the information systems of the respective organizations (University and Province of Trento), and these facts are also confirmed by other installation of our platform by other users, private and public organizations that particularly need this integration.

Our research group has been involved for years in the design and development of e-learning applications; in the new L3 system we realized that the simple re-design of a traditional e-learning system was too limited respect to the needs, mainly

- users' active participation in a more "social" sense
- deep integration with the information systems of the public administration

We would like to demonstrated that having a virtual communities platform with a different approach to people aggregation is an advantage respect to traditional LMS. Finally, having built the software platform from scratch is probably the most interesting fact in the perspective we are presenting in this paper: having the source code of an open source software that has not been built from zero by the developers is not enough to be effective in complex and pervasive integrations with the information system of the organization.

The paper is organized as follows: in the next section we will describe the rationale behind our decision of developing a customized version of our "Communities online" platform, with a brief presentation of the platform itself, able to easily integrate into the existent information system and providing new services and new opportunities to participants, teachers and tutors.

In section three and four we will analyze the architectural differences and the critical points of the shift from the experience of our university to other types; in particular as how the Lifelong Learning project that involves us at the moment with the Autonomous Province of Trento or the adoption of other types of collaborative approaches typical of the so called "Web 2.0" could change the philosophy of an e-learning

system. We will present the discussion, currently active, of the possible transformation of Online Communities to meet the requirements defined in the previous sections. The last part will introduce some web 2.0 functionalities and the implications of their inclusion inside a learning community platform.

2. VIRTUAL COMMUNITIES: THE RATIONALE

On Line Communities is a dynamic web application that has been created for supporting blended learning activities by the University of Trento. In contrast with other LMS such as Moodle and Blackboard, the system is not based on the metaphor of "course" but that of "virtual community". On Line Communities enables to create, in a generalized way, different types of virtual spaces called Communities, to aggregate them into larger organizational structures and to endow them with generalized co-operational services.

This approach is slightly different respect to the proposal of some other authors, such as Beamish [1], that considers the virtual community as a group of people who communicate using computer mediated communication tools. Participant of these communities are physically in different places but however they can exchange information on common interest in a communitarian way. Virtual communities are considered by Rheingold [2], the original creator of the definition of VC, as emerging social phenomena. Our approach is conditioned more by the ideas of Jones [3],[4] in which the technological structure of VCs (named virtual settlement) is conceptually separated from the community itself. In our projects, normally we have a double role: designers and developers of the technological infrastructure, but on the other hand we are teachers and administrators of the platform and of several communities. In other words, we are at the same time managers and users of the platform. We therefore understand the need to separate what technologically the platform can do from how customers use it.

As stated, one of the starting points of this approach concerns the process of cooperation and exchange inside a VC. The concept of VC could be associated to what in this moment is commonly defined as Web2.0. The term Web2.0 [5] was coined following a reflection on the evolution of the Web and the self-selection of the Web Applications after the collapse of dot.com companies. In any case, "Web 2.0" is not the definition of a neo-digital structure, but just a label that identifies the evolution of the structure of the pre-existing global net in the "social" sense [10]. The user plays an active role both as author and as manipulator of the contents of others. It is not a new concept of web but a new way of using the web. We permeated our paradigm of VC, and integrated in our platform not only the participatory level but especially the collaboration among users of our system., removing those aspects of social network platforms that, in our opinion, are useless if not harmful in educational settings. We partially integrated some elements coming from web 2.0 and new e-learning approaches, but on the other side we considered and implemented inside the platform some new concepts to develop collaboration activities (the "virtual community" as a container of activities and collaboration, instead of the strict "classroom" concept), thus implementing an easier and deeper integration with the information system that the organization has in place. As mentioned, our best test bed has been, among others, the "L3-lifelong learning" project, conducted since 2007 together with the Department of Innovation of the Autonomous Province of Trento (PAT). We believe that this experience represents an interesting opportunity to understand the applicability of distance learning and virtual communities to the public sector [6], due to the number of subjects involved, the temporal extension of the project, the extension of topics faced during distance learning sessions and the involvement of the organization in all the activities of distance learning. This work presents the first results of the project, after approximately five years, and its future development towards a "*virtual Community Environment*". What clearly emerged from our experiments is an interesting perspective for virtual community systems like ours:

1) private and public institutions need virtual collaboration spaces, places on the web with collaboration and web 2.0 tools available for their employees / partners

2) traditional LMS, like Moodle™, are not suitable for many of these needs, mainly because they are oriented to e-learning, and their pillars are metaphors like "classroom", "class", "course", rather than other ideas more oriented to collaboration, like "community", "group", "team", "secretary", "board", "office", "department". A classroom is, of course, a community, where collaboration is oriented towards a specific target, i.e., training, but the opposite is not necessarily true. This is just one component of collaboration, very important of course, but is not the whole idea that companies / public administration need. A community, in fact, can be many other things than a classroom. It can be a virtual collaboration space for a faculty council, a board of directors, a recreational group, a research group, a temporary association that needs to share some services [12].

3) social networks and tools, like Facebook™, Myspace™, youtube channels™, Foursquare etc., if used in learning settings, are not suitable for large and rigid organizations like public administrations, because of social networks' business models, where numbers and objectives are not allowing small, "private" communities where collaboration can take place in a private, reserved, personalized space. The main objective is "the more we are, the more we will interact": this is not exactly what a public institution wants in most settings.

3. ONLINE COMMUNITIES: A BRIEF PRESENTATION

Business models are typical of any product / service that can aspire to success, and software systems are not excluded from this consideration. Every software system requires the presence of a model of how to perform the activities which that model aims to promote. In the case of an educational activities and Learning Management systems, the model below pertains to how a certain system hypothesizes that the teaching activities of an educational organization are performed. Therefore the use of a software platform imposes limits on how the task for which the LMS is designed will be conducted.

The system that is analyzed in this paper was developed at university for blended teaching almost 15 years ago. It has gone through the following stages.

1) In its first implementation named *"Corsi on Line"* (online courses) the system had only one business model which followed the traditional structure of academic teaching.
2) In its second implementation, the system, based on virtual communities, allowed to extend the traditional lecture-based model to other forms of academic teaching (cooperative learning, learning by project, etc.), thus favoring multiple "business models" related not only to pure training activities, but also supporting collaboration, document sharing, public discussion places etc.
3) At its current stage the system has been changed so as to allow the implementation of business models not involved in academia, but rather orientated towards projects of life-long learning and integration with the services already available in any information system: single sign-on, accounting system, ERP-HR services, time and project management etc.

In the year 1999-2000 the Faculty of Economics at the University of Trento decided to take up a software system enhancing its traditional educational activities by means of a web-based extension. It aimed to structure coherently the personal initiative taken by teachers who had activated autonomous web pages related to their courses. A Learning Management System was necessary to achieve this goal, i.e. software being able to manage as a whole the distance teaching that was put beside the academic courses. The Faculty was presented with three options: purchasing commercial software, using free software or building its own platform, although at that time free LMS platform were not available and the discussion was about adapting other academic software for LMS-like purposes.

The decision to build its own platform was a consequence of various reasons which we can summarize as follows. The use of commercial software would have been possible at too high a cost (acquisition, maintenance, management and training) when compared to budget limits. On the other hand free software was at that stage rather rudimentary. The substantial reasons for the choice of building a platform were more strategic than technical:

- The system did not have to replace traditional teaching. Rather, it had to broaden teacher-student communication (blended approach).
- The use of Computer Mediated Communication (CMC) techniques did not have to be imposed on teachers or students. In fact, there are teachers and students who do not find e-learning attractive and do not appreciate the system even at present. They must not be considered to be bad teachers or students.
- The system had to be a web dynamic application so it could be used by any computer connected to the Internet, and it had to be constructed following a developmental approach so as to keep a bond as strong as possible between developers and users.
- Following the usage of the LMS, educational or technical intermediaries did not have to intervene between the teacher and the students, in order to reproduce exactly what happens in our Faculty. Creating professional intermediaries would have generated two undesired effects: in the long run, it would have turned out to be financially unbearable and delayed the development of the ability of the teachers to perform their job in an innovative and autonomous way.
- In the virtual environment - created by means of software - of an educational institution, anonymity had to be banned so that the players could not abdicate responsibility.
- The system had to be neutral when compared to the Learning Object (LO) standards used by the professors in their teaching. In other words, the system had to allow teachers to use both standard LOs – e.g. SCORM – and non-standard LOs.

After the first 5-year trial conducted on the *Corsi Online* (online courses) system, our team focused on carrying out a platform based on the structure of the learning virtual communities. We consider a virtual community like a space on the web dedicated to a collaboration objective [7][8][9], populated by people who communicate among each other, using a series of communication systems.

According to our interpretation, a Virtual Community is not the result of a process of social networking. In fact, it is a virtual space shared by groups of people who have a common goal. A community's virtual space can be simple or complex; for example it can contain further virtual communities, thus establishing a hierarchical "father-son" relationship. The (virtual) community can be an open space accessible to anyone. However it can also be a restricted space, the access to which is reserved only for some people authorized by the community administrator. The users can have different roles with rights and duties which vary in the use of space and CMC services activated in a virtual community. The system maintains the consistency of the whole social environment of the virtual communities

which are active at a given time, in that it provides users of a community with a range of on-demand services that can be activated and used in accordance with the permissions granted and the roles assigned.
This structure has allowed us to shape the organizational structure of an educational institution easily. For example, the communities of the teaching courses are components of larger communities called "Degree courses", which are in turn part of the "Faculty" community. On the other hand the community "Faculty" also includes the community "Faculty council", a community restricted to the only members of the council, as well as other heterogeneous communities, such as the "chess circle" or "first year students" community, with its organizational structure, promoted by the Faculty Board to help new students settle down rapidly. Every community exists within a scope and with one or more goals, and according to these goals, different services provided by the platform can be activated. *On Line Communities* includes many services or functions that every user can use in his/her learning experience. Providing a detailed list is not the goal of this brief presentation. This said, the system is able to offer services such as:

- "traditional" asynchronous e-Learning (upload and download of learning material, newsgroups, forums, notice board, lecture schedule, management of lecture halls, management of the prospect of courses, management of users, etc.) and synchronous (chat room, audio/video streaming, etc.);
- "personalized" e-Learning, closer to aspects of Lifelong Learning (LLL) and training on the job (tutorship, training on demand, contextual search tools,FAQ, etc.);
- Integration with external information systems, such as the student service office (register of the lectures);
- use of offline courses, i.e. courses having already been taught by teachers. They are recorded, digitized and provided to communities of users (with the opportunity of synchronizing the videos with slides, podcasts, webcasts, SCORM modules, etc.);
- creation and use of self-assessment test to check learning, questionnaires, surveys, opinion polls;
- statistical analysis of users' behavior (*On Line* Communities collects figures in a data warehouse regarding the actions performed by users for subsequent statistical analysis).

Over the last few years the system has evolved into a platform for professional training orientated to lifelong learning outside academia. The new implementation of the system has retained certain basic features of earlier versions, while also extending its functions in order to allow business models which are typical of training within the company. Such evolution has brought about the need to develop previously neglected aspects, especially with the aim of controlling the students' activities more extensively.

The chronological description of the authors' path aims to highlight two aspects which we consider to be rather neglected in the debate over this type of software applications. The first deals with the connection between the development of the software and its applications. Our goal is to show the need to evolve from the unspecific idea of an LMS as a general purpose platform of an unspecified educational institution [11]. On the contrary, what should be highlighted is that such an effective technological tool should embrace the (social and technological) context where teaching and learning take place. This idea originates from the fact that the context of use should determine the services and instruments which the software should offer, not the other way round, as often happens.
The second aspect deals with the relation between LMS and more general information systems of the institutions. At the moment e-Learning platforms seem to be built to act in a restricted circle made up of only teachers, tutors and students. We would like to show that this idea is actually deceptive and the LMS should be designed to be a wider and more complex module of information systems.
The portal has the possibility of including a community into another, creating a tree of nested communities. It is also possible to aggregate the communities into a transversal super-community, so creating a mesh of connections composed by the different links among communities from different branches of the tree. With these types of mechanisms, it could be possible to model many types of collaborative structures, even of a high complexity. For example, hierarchical structures like Faculties, Didactic Paths, Master Degrees, Courses, Work Groups related to a course, all the hierarchical relationships between these communities can be easily represented. Most of all, this hierarchical structure allows to map the organizational chart into a tree of communities able to represent each unit in the company, facilitating the replication of dependency relationships inside the organization onto a structure of virtual collaboration spaces.
Online Communities had been experienced with limited number of users since 2003, and was finally released on early 2005. As from 2005 it was used by the whole faculty of Economics of our University in all its components (students, teachers, dean, secretaries, administrative staff, external partners) and others faculties are using the system in many courses.

4. INTEGRATING VIRTUAL COMMUNITIES AND INFORMATION SYSTEM SERVICES

Along the process of adopting the virtual communities platform inside its information systems, the main users of "Online communities" almost immediately asked for a strict integration of the two worlds, due to the characteristics and potentiality of this integration both for end-users and for the organization. We found, and are still finding, many resistances to this process of

integration: many different scenarios whose power position has been "attacked" by the generalization of the metaphor of "virtual communities" and its already-available, ready-to-use services. Just to mention the most evident:

- pre-existing applications colliding with "online communities" services (Document management systems, internal blogs, forum, time management tools, shared agendas…..)
- competitors already present with their specific offers
- off-the-shelf solutions already selected and therefore threatened by our multi-purpose, all-in-one solution,
- previous project still not concluded

More than this, it's been quite easy to integrate our platform with pre-existing services of datasource, through the usage of web services created on our side, or on the provider side to exchange data between the different platforms.

Here follows a simple list of some of the connections of the virtual communities system with the rest of the information systems. Some of them have already been created, some of them are on the way, some of them have been (not mysteriously) declined due to the above pressures or legitimate choices, others are in the future developments of the integration. We have classified them in several categories of integration services:

- Authentication services
- Authorization services
- Participants records alignment and exchange
- Attendance records (for HR department)
- attendance certifications
- Time management(agenda, doodle, task management)
- Ticketing, tutor and teacher requests
- Accounting and ERP integration
- Automatic membership to specific communities
- Payment management
- Questionnaires / polls
- Public tenders and concourses
- social media from e-learning to open innovation

Due to size limitations, in this paper we will present just four of these items.

A first important element, substantially requested in every of our installations, is the integration with the authentication and authorization system of the organization. This has been the first and most important (from the user perspective) integration we built also in the L3 project. Single-sign-on is an immediate need of integration between the educational system and the rest of the information system, but here we find a second problem of integration, i.e., the authorization schema of the employee. What are her permissions? Which courses can be attended? What material can be seen by this person depending on her permissions? Who can participate to which course / community? To these and many other issues, manual implementation and replication must be created. In general, any e-learning platform should provide it, but one thing is by far more difficult in traditional "classroom-based" platforms. Virtual communities, as said, have hierarchical relationship among them, while e-learning platforms don't have this. So, it has been straightforward to implement a direct mapping between communities and the organization chart of the institution, thus providing a structure of communities that perfectly re-create, with respective permissions and hierarchical relationships, the hierarchical relationships present in the organization.

This aspect is not only related with permissions on the communities that are part of a certain branch, but also (and particularly) with the objects included in these communities, specifically documents, forum posts, FAQ and wikis.

Last but not least, a deep integration is fundamental for another reason: when something changes into the original directory of the organization's information system, these changes must be immediately aligned into the educational system. For example, an unauthorized access to some material by an employee that recently changed workplace is not so relevant for pure educational activities, but could make a great difference when in this repository different types of documents are stores. So when the LMS is used as a document management system for e-learning activities, permissions on documents are dependent not only on the role of the participant in the course, but could also refer to the position of the person inside the organization. Virtual communities of scope allow to map the organization schema on the organization of communities, inheriting all the needed permissions for any organization member, and being immediately updated on changes in workplaces, job position and roles inside the company.

Going on in the selected examples of integration, the interaction with e-learning platform is very often characterized by the presence of a tutor. Tutors are crucial elements for the success of any e-learning initiative, because of their role of bridge between the participants and the institution or the teacher. How can we book, as participants, a virtual interaction with a tutor? How can we interact with the institution if we have a problem? Regarding this last point, in our experiences of managing considerable numbers of participants like in our university (16.000) or in PAT (20.000), the helpdesk created around and e-learning initiative is very important, but most of all, it is important in public settings. We are not necessarily dealing with high-level support (from the teacher, for example), but most of the time what is needed is a pure helpdesk-like service, that takes care about simple problems that prevent the user to use the learning resources. What we have done in this sense is using virtual communities specifically created for help-desk, and developing a ticketing system like many services of this type, where the user can book a slot with a "solution provider", could this be a specialist for hardware problem, a process tutor or even the teacher herself.

Last example regards a fundamental integration for institutions that manage courses for relevant number of people. When an online edition (full or blended) of a course is available in the offer of the institution, some activities are managed substantially by the LMS (or equivalent system), specifically those related with the educational part. However, together with these activities, many other tasks are needed before the beginning of the course delivery, and these activities are very often effort-driven activities for the administration of the institution. Among the others:

- Providing information to potential subscribers about the course
- Enrolling people to the course
- Providing different and specialized communication to the different actors (potential subscribers, teachers, tutors, administrative staff, etc.)
- Create the virtual community for the course
- Upload materials and documents to inform people about that course
- Organize time of subscribers (meetings, videoconferences, appointments, shared agenda etc.)
- Organize a forum for discussions before the beginning of the course

It should be clear that all the people involved in the above processes can be easily grouped together in a community, where they can receive and use communication and management services available for the members of the community. Once the community has been closed (registration is close) that virtual space can be transformed (or migrated) into a virtual learning community, without any other effort or procedure.

The above items are just some examples of needs of (deep) integration between different components of the information system and a (flexible) platform that could delivery educational contents (but not only). More than this, the integration should be transparent to the user and should not be limited to the pure educational aspects.

All these features have been implemented in Online Communities with a very limited effort, as we took advantage of the approach based on a community as a set of services available to users with a specific role to play inside the community itself.

5. CONCLUSIONS

The paper discusses the idea of integration between educational platforms and the information system of any institution involved in educational activities. In our opinion, a different metaphor is needed between typical LMS, bonded to the "classroom" metaphor, and social networks, where the main objectives of participants are different from learning. The paper describes the peculiarities of a "built-from-scratch" virtual community system, where some features are specifically devoted to collaboration (thus overcoming main problems found in web 2.0 tools), and other features are totally new and only feasible thanks to specific characteristics of our platform, like inheritance, polymorphism, permissions and roles granularity.

Our experiences in the university context and later (the last five years) also addressing some public administrations and private institutions, allow us to make some comments on the most useful services for our users. Even in the public administration there is an increasing need to make a personal professional (or learning) space available to its employees, based on a deep integration with the rest of the services that normally employees have at their disposal, not just to store the teaching materials used in class, but also to manage their time and their activities, communicate with the colleagues, carrying out projects or homework.

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An Attempt to Employ Diagrammatic Illustrations in Teaching English Grammar: Pictorial English grammar

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ABSTRACT

In order for intermediate students poor at English grammar to enjoy learning it, a unique methodology has been improved in the classroom. In this article illustrated vehicles relevant to the five basic sentence patterns are presented in order to show how helpful this method is to understand English grammar. Also, more enhanced areas of this theory are discussed, which clarifies the feasibility of this methodology. The items to be introduced in my method are gerund, the passive voice, the relative pronoun and so on.

Keywords: Basic sentence pattern, English grammar, Parts of speech, Nexus, Gerund, Passive voice, Relative pronoun

1. INTRODUCTION

The main aim of paper is to explore a special methodology in teaching English grammar to intermediate students. I focused on employing diagrammatic illustrations in which the function of parts of speech is highlighted, so that they can comprehend the concept of English grammar.

In this paper, contents of this method are introduced, showing the advantages of the methodology.

2. BACKGROUND SURVEY

The typical categorization of sentence patterns in teaching English grammar is shown below. S refers to a subject, V to a verb, O to an object and C to a complement.

(I) 1st sentence pattern: S + V
(II) 2nd sentence pattern: S + V + C
(III) 3rd sentence pattern: S + V + O
(IV) 4th sentence pattern: S + V + O + O
(V) 5th sentence pattern: S + V + O + C

The presentation of the five basic sentence patterns is useful for students, because it systematizes and synthesizes English sentences in terms of syntax. Students can learn what English sentences look like, along with acquiring knowledge of the functions of different parts of speech. However, it is also an undeniable fact that there are quite a few controversial or as yet unresolved issues as to whether the sentence in question is categorized into one of the five basic sentence patterns appropriately. For example, the categorization of the sentence, *I want you to go there,* is problematic, because some grammarians regard it as being out of the five sentence patterns. In fact, even posing the question may not be meaningful, because the categorization of sentence patterns varies according to the theoretical viewpoint of individual grammarians. There are many vague areas which are not worth discussing extensively in grammar books overseas. Despite the issues mentioned above, the categorization using the five sentence patterns can be useful to intermediate learners of English, who primarily need help in understanding the great differences in the construction of sentences in English and Japanese.

Taking the categorizations into account, the following section shows my own subdivision and the feasibility of using the subdivision along with the relevant illustrated vehicles.

3. VISUALIZATION OF ENGLISH GRAMMAR

Basically, the notion of visualized vehicles is based on the concept that each sentence pattern pertains to one basic vehicle chassis or a body of the sentence. Each basic sentence pattern is now presented, along with explanations of the function of figures.

The first sentence pattern is drawn:

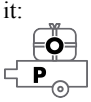
The aim of this visualization is to make students understand the rule of grammar, so using this vehicle, they are taught some crucial rules.

Firstly, the chassis has a tire (or tires) and appears on the invisible ground. Secondly, the subject sits behind the wheel.

An example of the first sentence pattern is *I run*.

The other item which is not relevant to the body of the sentence but has a tire is a cart (see below).

P (standing for preposition) can be put on the ground with an object on it:



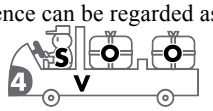
Then it can be connected to the body of the vehicle. Let me cite an instance in *I went to school.* :

Note that *went*, which is the past form of *go*, has a chassis of the first sentence pattern, so *I went school.* is not a correct sentence. Instead, a cart *to* is required to put *school* on it, which serves to illustrate the need for the preposition *to*.

Next let me skip over the second sentence pattern and move on to the third sentence pattern. Because the S + V + O pattern has a characteristic of having O, the body of the sentence is drawn:

This shows that an object O mounts a carrying platform.

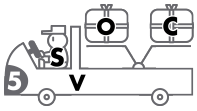
When two objects mount the same carrying platform in a row, this sentence can be regarded as the fourth sentence pattern:



Mostly, the first object tends to be an animate entity and the second one an inanimate object.

The other sentence patterns are the second sentence pattern and the fifth sentence pattern, both of which have a complement, C. The second sentence pattern is made up of S + V + C:

This figure looks like a deformed seesaw, indicating that the subject is equal to the complement, or in other words, V can be replaced by the symbol '='. So, *I am a teacher* can be regarded as *I = teacher*. The fifth sentence pattern comprises the identical behaviour between O and C on a carrying platform:



In this case, we can safely say that the condition of O = C is made by S by doing something related to V. So the sentence *I made them happy.* is considered to be like the condition that *they are happy* is a result of the action *made by me.*

4. ADVERVS

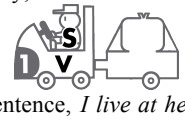
So far the vehicles with a cargo of the preposition have a tire (or tires) but adverbs also have a tire, so adverbs are drawn:

When a adverbial word, *yesterday* is added to the complete sentence, *I went to school*, the illustration is :

Focusing on the syntactic function, the prepositional phrase, *to school* also functions as an adverb. This shows that when the prepositional phrase functions as adverb, it has a tire, and that adverbs themselves also have a tire.

The straightforward explanation of the function of the adverb is: adverbs modify verbs. For example, *yesterday* can be compared in the following two sentences, firstly, *I remember yesterday*. vs. *I remembered this song yesterday*. Obviously, *yesterday* in the former sentence is an object of the verb *like* whereas in the latter it is an adverb. For Japanese students there are many adverbs which cannot be recognized as such, like *here*, *there*, *home*, and *abroad*. Therefore, visualization will make it easier to understand the structure of sentences.

Let's say, *I live here* can be drawn:



The sentence, *I live at here.* is not a correct sentence, which can be easily accepted.

5. IMPERATIVES

When students are asked to put into Japanese a sentence like *Always go there*, some of them answer incorrectly. They do not identify the sentence as an imperative, which comes from the fact that they do not regard *always* as the adverb. Or they may not expect any words before a verb in the imperative. But as a diagrammatic vehicle shows:

Imperative sentences have no subjects, and the presence of adverbs or adverbial phrases will not change the categorization of the sentence. What is more, due to the tire which helps the vehicle to move around easily, the position of adverbs and adverbial phrases is relatively without restriction. Students learn these concepts by an imperative sentence:

Always put on socks here.

In case of fire enter here. (description on a sign)

6. ADJECTIVE PHRASES

The presentation of prepositional phrases has so far been restricted to adverbial phrases alone but we can not ignore that adjectival phrases are included as well:

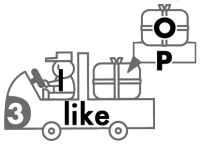
the boy with glasses

the lady in jeans

The phrase, *the boy with glasses* is drawn:

The pin which sticks in the noun, *the boy* indicates the modification to the noun.

The sentence, *I like the boy with glasses.* is drawn:

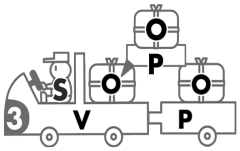


cf.  : the boy  : with  : glasses

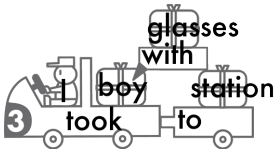
Then students can expand this visualization to more complex sentences:

I took the boy with glasses to the station.

If they can associate the sentence with the vehicle:



then they can be expected to understand the function of adjectival and adverbial phrases. However, the assessment of whether it is adjectival or adverbial depends on semantic judgment. In *I took the boy with glasses to the station.*, *with glasses* is an adjectival phrase and *to the station* is an adverbial phrase as follows:



We can easily surmise that adjectives which mostly modify nouns can be drawn:

7. *TO* INFINITIVES

The basic form of *to* infinitives can be represented as:

The form of *to* infinitives can be the result of a transformation of the complete sentence and all basic sentence patterns can be transformed into *to* infinitives.

This form can be divided into three forms, based on the notion above:

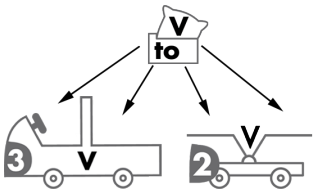
as nominal *to* infinitives,

as adverbial *to* infinitives, and

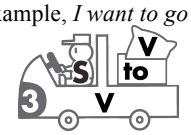
as adjectival *to* infinitives.

Nominal *to* infinitives, 

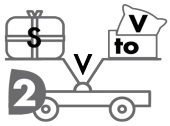
can be placed in various positions :



For example, *I want to go* is drawn:

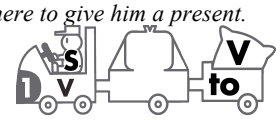


My aim is to become a teacher is drawn:

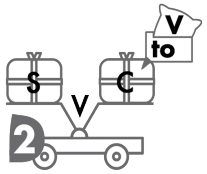


As for adverbial *to* infinitives and adjectival *to* infinitives, diagrammatic vehicles are respectively drawn:

I came here to give him a present.



This is a song to make them happy.

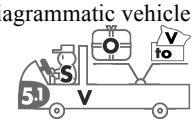


Note the removal of subjective information which occurs in the process of forming *to* infinitives.

8. EXTENDED SENTENCE PATTERNS

Sentences such as *I want you to go there.* and *I made her go there* are rather problematic, as it is debatable whether these sentences should be categorized into the fifth sentence pattern or not. An alternative would be to treat them as a sixth basic sentence pattern. However, my thesis categorizes such sentences into the fifth sentence pattern, so we can identify how similar the vehicle of these sentences are to those of the fifth sentence pattern.

The diagrammatic vehicle in *I want you to go there* is drawn:

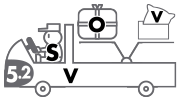


The difference between this one and the fifth sentence pattern is that the complement is replaced by the *to* infinitive. That is, the portion of the *to* infinitive, *go there* comes from the sentence, S1 *go there* (S1: subject). Then the question is: what does S1 imply? In this sentence pattern, the subject of the *to* infinitive refers to the noun preceding the *to* infinitive.

Visually, in the sentence above, the element O is a subject of the verb of the *to* infinitive. Therefore, S1 in S1 *go there* (S1: subject) is *you*. That is, we can associate with the complete sentence, *you go there*. When it comes to the interpretation of the sentence, *I want you to go there*, the process is, firstly, I want something and secondly, something means *you go there*. In this way, the relationship between nouns and verbs is called Nexus. My study postulates this sentence pattern as the Etoki5.1 sentence pattern. Japanese word Etoki is the original abbreviated expression of pictorial English grammar in Japanese.

What is noteworthy in this sentence pattern is that the verbs used are very specific: *want, tell, ask, allow,* etc.

Another vehicle which is included in the sixth sentence pattern, but here is referred to as the 5.2 sentence pattern, is employed:



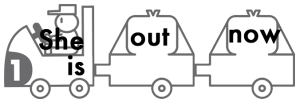
The typical sentence is *I made her go there.* The difference from the 5.1 sentence pattern is that in the 5.2 sentence pattern the *to* of a *to* infinitive disappears. However, we should note that there is a relationship of Nexus between O and V in the vehicle. The verbs in the Etoki 5.2 sentence pattern consist of causative verbs such as *make, let, have* and cognitive verbs such as *see, hear, find*, etc.

9. APPLICATION IN THE CLASSROOMS

Once students have understood the diagrammatic framework, it is time for them to apply it to grammar study. In this section, English sentences of the five basic sentence patterns and the visualized vehicles are presented with English words on them. Also, some comments are added to describe how to comprehend the structure thoroughly.

a) The first sentence pattern

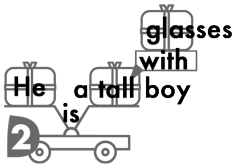
She is out now.



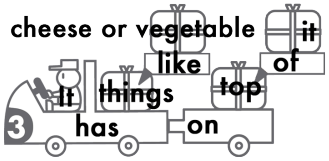
The verb *be*, *is* is the existential *be* and it is grammatically different from *be* in the second sentence pattern. In order to strengthen the understanding, it is expedient to let the student

associate this sentence with *She is home.* or *She is abroad.*

b) The second sentence pattern
He is a tall boy with glasses.

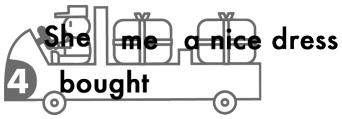


c) The third sentence pattern
It has things like cheese or vegetable on top of it.

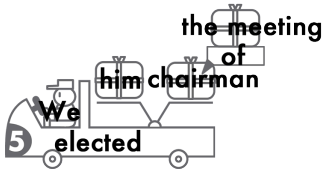


It seems to be a complicated sentence but is just the third sentence pattern. Note that it is common that prepositional phrases follow the third sentence pattern like this.

d) The fourth sentence pattern
She bought me a nice dress.

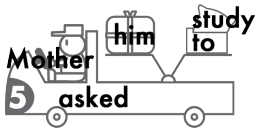


e) The fifth sentence pattern
We elected him chairman of the meeting.



In view of the second sentence pattern, a sentence, *he is a chairman of the meeting* can be focused on. Also *of the meeting* is not an adverbial phrase but an adjectival phrase.

f) The Etoki 5.1 sentence pattern
Mother asked him to study.

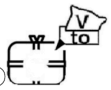


In the Etoki 5.1 sentence pattern, the notion of Nexus is crucial. Focusing on the relationship between *him* and *to study*, *he studies* should be understood. Then idea of interpretation is that mother asked him to do something and to do something means that he studies. In the following sections, these notions are extended to Ving form, the passive voice, relative clauses, conjunctions and attributives.

10. GERUNDS AND THE OTHER VING FORMS

Just as *to* infinitives have the three forms, the Ving form has the identical three forms in Table 1: the nominal form of Ving is a gerund, the adverbial form is a participial structure and the adjectival form is a present participle.

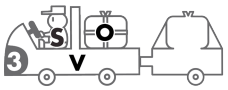
Table 1 Each form in to infinitives and Ving form

	to infinitives	Ving form
nominal form	① 	④  gerund
adverbial form	② 	⑤  participial structure
adjectival form	③ 	⑥  present participle

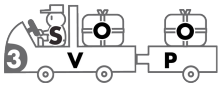
11. CONJUNCTIONS

In my class, I begin teaching by comparing three underlined words below.

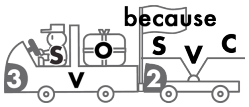
a) *I read the book yesterday.*



b) *I read the book before lunch.*



c) *I read the book because it was interesting.*



The aim is to make students identify the underlined clause in c), which is also adverbial in terms of function. The explanation is as follows.

In a), students are taught that *yesterday* is an adverb by showing that in Japanese translation, *yesterday* modifies the verb, *read*. In b), *before lunch*, which is an adverbial phrase, modifies the verb, *read*. Therefore, the identification of the underlined sentence in c) leads to an understanding of adverbial clause, which refers to a subordinating clause.

12. PASSIVE VOICE

Explaining what the progressive or the perfect sentence is in the classroom is not so difficult in Etoki because I have only to explain that transforming into the progressive and the perfect sentences is to undertake the procedure to exchange the V type engine mounted on the vehicle. That is, the finite verb can be changed into the *be* + Ving(the present participle) or the *have* + p.p. (the past participle), respectively.

When it comes to the passive voice, however, the procedure to transform from the original form is very different. In Etoki, another vehicle is employed for the passive voice:

The flow of transformation of the passive voice is illustrated in the picture of Fig 1 along with the Japanese translation.

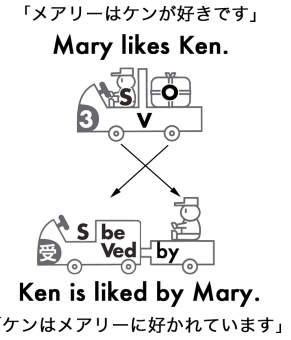


Figure 1 Transformation into the passive voice

As this picture shows, the object of a declarative sentence can be placed at the position of subject of the passive voice sentence, which is the vehicle standing for the passive voice. The vehicle is followed by the preposition *by*, on which the subject of a declarative sentence is placed.

The passive voice is not so simple because in the fourth and the fifth sentence patterns, we must have a more sophisticated notion, which is depicted as a tray mounted on the rear of the vehicle:

On this tray,
something important is placed.

Given that nominals mount a driving position, a carrying platform of vehicles or of prepositions in Etoki, this tray is design like that.

Then the point is what is placed on the tray. With this regard, as for the fourth sentence pattern, the object arrayed on the left in a declarative sentence is placed on the tray as illustrated in Fig 2.

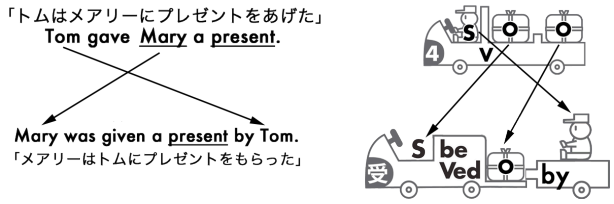


Figure 2 The passive voice of the fourth sentence pattern

Almost the same is true with the fifth sentence pattern as illustrated in Fig 3.

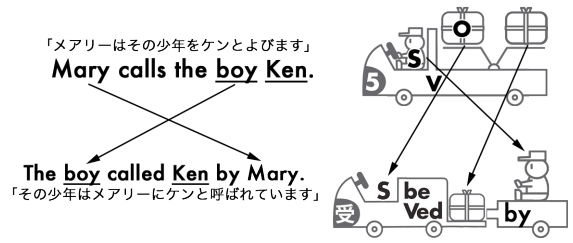


Figure 3 The passive voice of the fourth sentence pattern

In the Etoki 5.1 sentence pattern in Etoki, the part of the *to* infinitive is moved to the position on the tray, illustrated in Fig 4.

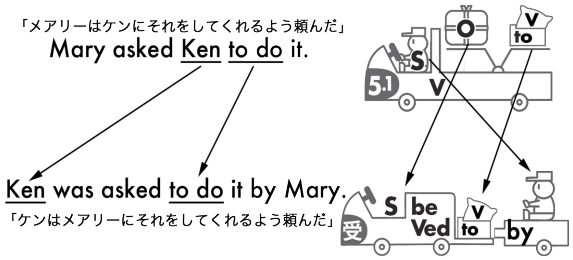


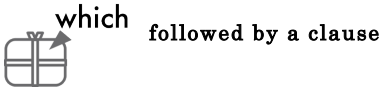
Figure 4 The passive voice of the 5.1 sentence pattern

Noticeably, in the Etoki 5.2 sentence pattern, the bare *to* infinitive comes back to the original form, the *to* infinitive as illustrated in Fig 5.

Figure 5 The passive voice of the 5.2 sentence pattern

13. Relative pronouns

The function of modification is indicated like a pin, ▶ or ◀, so that the relative pronoun and the following relative clause follows the pin:

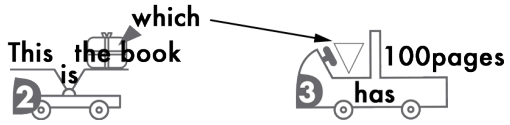


In Etoki, the relative clause looks to be floating, while main clause exits on an invisible ground.

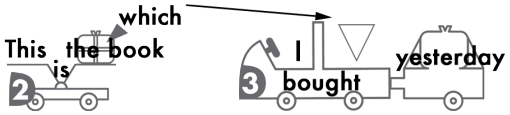
Other than the pin, which shows the function of modification, there are two items. One is a triangle illustrating the position of

an antecedent, which is in the main clause. Therefore, the arrow shows the location of the antecedent in the relative clause.

The same is true with in *This is the book which has 100 pages*, which is drawn:

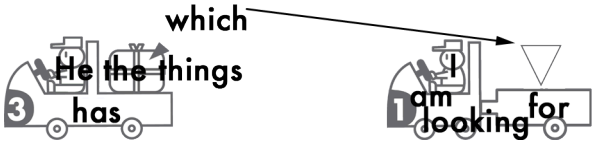


In *This is the book which I bought yesterday*, the difference is that the antecedent is visualized in the position of object of the relative clause whereas in the former examples they are visualized in the position of subject of the relative clause. The sentence, *This is the book which I bought yesterday*, is drawn:



So far, the antecedent is a complement of the main clause.

In *He has the thing that I am looking for* Etoki is shown like below:



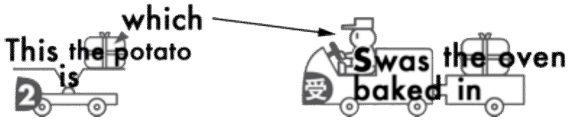
Some of the students look annoyed by the position of a preposition which ends the sentence. By explaining the structure in Etoki, they can understand it with ease.

14. ATTRIBUTIVES

Let me discuss the structure of *This is the potato baked in the oven*. We can simply say that *baked in the oven* is the attributive phrase which modifies the potato. In Etoki, the explanation of structure starts with the sentence, *This is the potato which was baked in the oven*. Etoki illustrates the structure:

transformed into the passive voice

⇩



What should be noted firstly is that the relative clause comes from *Someone baked the potato in the oven* shown above on the right side. Then it is transformed into the passive sentence, ▽ *was baked in the oven*. More importantly, in the sentence, *This is the potato which was baked in the oven*. *which was* can be omitted. Eventually, *This is the potato baked in the oven*. is completed as the sentence commonly used.

The same hold true with the sentence, *I like the lady dancing over there.* In this case, an original sentence can be regarded as *I like the lady who is dancing over there.* Then *who is* can be omitted, resulting in *I like the lady dancing over there.* If there is no adverbial phrase in each case above, that is, *This is the potato baked ~~in the oven.~~* and *I like the lady dancing ~~over there~~.*, the past participle and the present participle can be moved before the noun. That is, *This is the baked potato* and *I like the dancing lady*.

It is safe to say that one of the Ving forms is the present participle, which modifies the noun from in front, which is drawn:

eg. *dancing lady*

And the other is the past participle, which also modifies the noun from in front:

eg. *baked potato*

More importantly, in the sentence which includes the relative clause,

1) If the words are arrayed like:
   relative pronoun + be verb + the present participle,
   then relative pronoun + be verb can be omitted.
2) If the words are arrayed like:
   relative pronoun + be verb + the past participle,
   then relative pronoun + be verb can be omitted.

Note that there is only a difference in underlined words between 1) and 2).

15. APPLICATION TO MULTI-MEDIA

Based on the notion of Etoki, I have already done several things such as publishing an Etoki English grammar book written in Japanese (Takahashi, 2004) and broadcasting of my lecture in local TV. Especially, in the television program, by showing a moving presentation which is one of the function of Keynote by Apple, I could give an interesting and persuasive lecture to viewers. It is hoped that a multi-media technology will create a fascinating methodology for those who want to comprehend the concept of English grammar.

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Adoption and Use of ICT in Enhancing Management of Public Secondary Schools: A Survey of Kesses Zone Secondary Schools in Wareng District of Uasin Gishu County, Kenya

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ABSTRACT

Information and Communication Technology (ICT) has become very necessary in all aspects of life. ICT technical skills are essential in ICT use and application. In order to obtain benefits from using ICT, both ICT technical skills and managerial skills related to ICT are needed. Managerial skills involve management's ability to develop ICT applications to support and contribute to other management functions in organizations. In the field of education, ICT has begun to have a presence but the impact has not been as extensive as in other fields. The study sought to establish adoption and use of ICT in enhancing management of secondary schools in Wareng District. The study adopted a survey research design technique. Six (6) schools were sampled for the study. The target population included 300 head teachers, deputy head teachers, Heads of Departments and BOG members. Fourty two respondents which represented 14 percent were sampled. Data analysis employed descriptive and inferential statistical techniques so as to infer significant relations among the research variables after which results were presented in tables. The study findings established that most of the schools had computers that were used for typing examinations and other secretarial duties other than performing management functions. However the level of adoption and use of ICT in the management of schools was slightly high in boarding secondary schools as compared to day secondary schools. There was a general agreement among the respondents that ICT adoption and use in schools had remarkable benefits which included: Improved data management, improved communication and effective management of student's records among others. Despite the benefits, the study also revealed that the school management had not fully realized the full potential of adoption and use of ICT in performing management tasks due to several challenges, among them; lack of skills and financial constraints.

Key words: Information and Communication Technology-(ICT) and Management of public secondary schools

Introduction: The adoption and use of Information and Communication Technology (ICT) is changing business processes, and the way people live and work. New innovations as a result of ICT are continuing to emerge [1]. If one was to compare such fields as medicine, tourism, travel business, law, banking, engineering and architecture, the impact of ICT across the past two or three decades has been enormous. The way these fields operate today is vastly different from the ways they operated in the past. But when one looks at education management, there seems to have been an uncanny lack of influence and far less change than other fields have experienced. A number of people have attempted to explore this lack of activity and influence [1].

As noted in Sessional paper no. 1 of 2005, Information and communication technology has a direct role to play in education and if appropriately used, ICT can bring many benefits to the classroom as well as education and training processes.

" Its use will provide new opportunities for teaching and learning, including offering opportunities for more learners greater opportunity for teacher-to- teacher, and student-to-student communication and collaboration, greater opportunities for multiple technologies delivered by teachers, creating greater enthusiasm for learning among students and offering access to a wider range of courses."[2].

National ICT Policy on Education: Kenya disseminated its ICT Policy during the year 2006 [3], with its vision being "A prosperous ICT-driven Kenyan society" and mission being "To improve the livelihoods of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services." The section on information technology sets out the objectives and strategies pertaining to ICT and education. The section highlights that the government will encourage adoption and use of ICT in schools and institutions of higher learning to improve quality of teaching and learning. The ICT policy states that; lack of a policy framework on e-learning has hampered its development and utilization.

In this regard, the policy outlines that there is need to:

a) Promote the development of e-learning resources;
b) Facilitate Public - Private Partnerships to mobilize resources in order to support e-learning initiatives;
c) Promote the development of integrated e-learning curriculum to support ICT in education;
d) Promote distance education and virtual institutions, particularly in higher education and training;
e) Promote the establishment of a national ICT centre of excellence;
f) Provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms;
g) Promote the development of content to address the educational needs of primary, secondary and tertiary institutions;
h) Create awareness of the opportunities offered by ICT as an educational tool to the education sector;
i) Facilitate sharing of e-learning resources between institutions;
j) Exploit e-learning opportunities to offer Kenyan education programmes for export; and
k) Integrate e-learning resources with other existing resources [3].

[4] Posited that Kenya has placed considerable emphasis on the importance of ICT in its Education Sector Support Programme (KESSP) as evidenced in the recent promulgation of the National ICT Strategy for Education and Training. According to him, the Ministry of Education has taken steps to support the implementation of the strategy either by direct action or through the various institutions and agencies with which it works. In addition, there are many other organisations not involved directly with the Ministry of Education that continue to be active in implementing and supporting projects involving ICT in education.

ICT in schools management has been elusive since most of the school management are either computer illiterate or technology ignorant, but the current global technological changes requires modernization and digitalization of almost every sector, be it educational or business. [5] notes that despite the apparent benefits of the use of ICT for educational purposes, studies showed that in many cases, the learning potential of ICT is deprived as many educational administrators are still not fully ICT literate and do not use it in the school management and teaching. It is with this background that the study on adoption and use of ICT in enhancing efficiency of secondary school management in Wareng District was conceptualized.

Statement of the Problem: Information communication technology skills play a major role in promoting the economy of a country. Many of the productivity gains in the developed economies over the past two decades can, to a great extent, be attributed to the impact of ICT. The government appreciates and recognizes that, an ICT literate work force is the foundation on which Kenya can acquire the status of a knowledge economy [2].

Education and training has a major role to play in the implementation of ICT policy. To begin with the sector itself is a major use of ICT, not only in education, training and research, but also in the management sector. Secondly, success in the use of ICT in all sectors will require sufficient and competent human resources that is well developed and equipped in the education and training sector. Thirdly, successful introduction and use of ICT in education and training institutions will play a major role in disseminating skills to the wider society and thus create a positive impact to the economy [2]. To achieve this, the government was to partner with other stakeholders in establishing ICT capacities across the country. It was also to facilitate the use of educational institutions as hubs of ICT dissemination as suggested in the Sessional paper No 1 of 2005.

The philosophy of education in Kenya is guided by the realization that technology is a critical form of wealth to any nation. There is a lot of emphasis that is given to ICT as a key pillar of education and training as noted in the policy paper Sessional paper no 1 of 2005. The use of ICT in education lends itself to more student-centred learning settings and this often creates some tensions among some teachers and students, little emphasis is given to the management functions in schools. But with the world moving rapidly into digital media and information, the role of ICT in education management is becoming more and more important and this importance will continue to grow and develop in the 21st century [5].

ICT is used to perform various functions in schools which include; instructional uses such as PowerPoint presentations, examination results analysis, record keeping, timetabling, research work, financial analysis, communication and supervision. But the adoption and use of ICT in secondary school management in Wareng District of Uasin Gishu County in Kenya is faced with many challenges. This has slowed down the expected benefits that would arise from the adoption and use of ICT in the management of schools.

Purpose of the study: This paper sought to explore the status of adoption and use of ICT by school administrators in performing management functions, in secondary schools in Wareng District of Uasin Gishu County in Kenya.

Objectives of the Study:

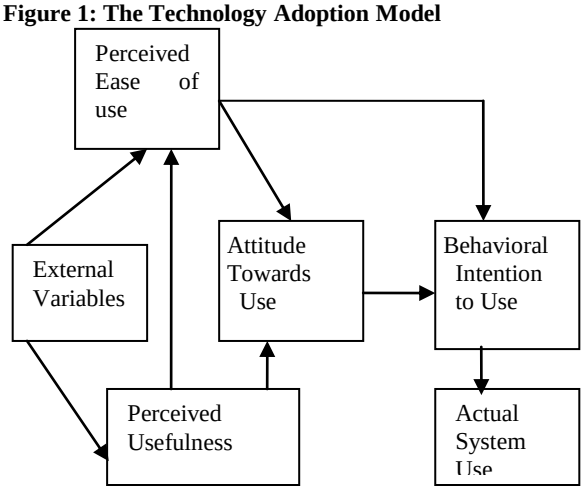
1. To investigate the extent of adoption and use of ICT in performing management functions in schools
2. To find out if there is a significant difference on adoption and use of ICT in performing management functions between boarding secondary schools and day schools
3. To determine perceived benefits of using ICT in performing management functions in schools
4. To explore the challenges faced by schools management in adoption and use of ICT in performing management functions.

Significance of the Study: The study findings will be expected to be useful to the management of secondary schools in Kenya by identifying barriers that limit the adoption and use of ICT by the management for managerial and instructional purposes. The study findings will bring to the fore the level of ICT adoption and use in schools and thus help the policy makers and planners in ICT policy formulation and implementation by revising the existing ICT policy with the aim of tackling the challenges affecting ICT adoption and use in schools in the country.

The findings of the study will also make management of schools easier and more efficient and effective.

Theoretical Framework: This paper is informed by the Technology Adoption Model (TAM) which is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. Technology Adoption Model (TAM) was developed by Fred Davis and Richard Bagozzi [6],[7]. [10] Distinguished the research on the determinants of information technology usage into two streams: those based on intention based model, exemplified by such theories as TAM, and diffusion of innovation, best exemplified by Rogers' diffusion of innovation theory. The TAM proposes two specific beliefs-Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) - that determine one's behavioral intention to use technology as shown in figure 1

Figure 1: The Technology Adoption Model



Source: Bagozi *et al* (1992)

Conceptual Framework: Management within the sector of services should use ICT because it provides many benefits at different levels [9] operational level, tactical level and strategic level. As figure 2 reveals, the use of ICT in Education management within the sector of services could improve management functions in secondary schools e.g. communication, ability to exchange data, teamwork, customer relations, visibility of services, and competitive advantage etc. This statement is based on the fact that ICT allows schools management to obtain, to process, to accumulate and to exchange information. Furthermore, in a knowledge management context, ICT can support transformation within and between tacit and explicit knowledge. Successful knowledge management initiatives could transform the small management capacity into a sustainable higher performance [10].

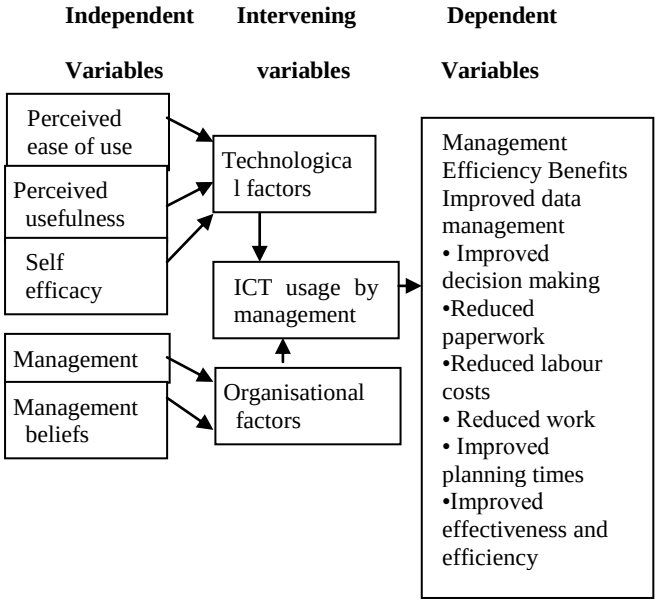


Fig 2: Operational Benefits of ICT Adoption and Usage by the Management

The above model shows the relationship between the independent variables and the dependent variables. The perceived ease of use, perceived usefulness and self efficacy of ICT relate to technological factors while management and management beliefs relate to organisational factors. These factors when put in place determine the ICT usage by management which in turn leads to benefits of using ICT.

THE BENEFITS OF ICT IN SCHOOLS

[11] pointed out that recently developed Intelligent Computer-Assisted Instruction (ICAI) programmes are able to generate and solve problems, diagnose students' misconceptions, select appropriate teaching strategies and carry on dialogue with students based on in-depth studies by researchers on how people think, learn and solve problems. However as, [11] notes these advantages are out of reach of most developing countries, where power and telecommunication facilities are poor, where resources and well trained teachers are scarce and where television and other forms of distance education costs are unbearable [7]. This view may be applicable to Kenya where schools ICT potential has not yet been fully exploited. There are three ways in which ICT can support education in schools. These are;

1. Supporting education in schools, providing non-formal education for out-of-school children and adults,
2. Supporting pre-service distance education of teachers and
3. Supporting in-service professional development, and enhancing the management of schools [2].

CHALLENGES OF EFFECTIVE ADOPTION OF ICT IN SECONDARY SCHOOLS:

Several factors were found to affect adoption and use of ICT in the selected schools [2]. The ICT skills of the school manager were seen as a major success factor. In cases where the Manager had ICT skills or had a keen interest, a trickledown effect was observed. This was evident at Wareng High School where the School Principal has a Higher National Diploma in IT and at St Cathrine Girls High School where the school principal has a lot of interest in e-learning and has even attended the past three international conferences organized by e-learning Africa. Providing all learners with computer literacy is seen as another success. Although the ratio of computers to learners is quite low in most schools, an attempt has been made to schedule all classes in the school for computer lessons in the teaching timetable. Learners have been allocated between 40 minutes and 100 minutes a week for computer lessons [2]. There are also several factors that hinder the implementation of ICT integration and use in schools and these include: limited time to prepare ICT teaching materials due to the loaded curriculum. Converting manual teaching notes to soft copies requires both time and skill. Teachers are also not motivated by this, being an added load to the curriculum with no additional remuneration or reward. The number of computers is a major barrier in that learners have to share the few that are available when they have computer classes. The inability to acquire more

computers or update those which are obsolete due to lack of finances and the fast changing information technology is another major hindrance [2].

Methodology: Research methodology is the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of particular methods to the desired outcomes [11]. A survey research methodology was employed in this study. Data was collected from a target population of 300 who included teachers and head teachers of secondary schools in Wareng District. A total of fourty two respondents were sampled for the study. Questionnaires were used as the main instruments of data collection where data was analyzed qualitatively and quantitatively using descriptive and inferential statistics.

STUDY FINDINGS

Characteristics of the respondents: The study involved a survey of secondary schools within Wareng District which was previously Kesses Zone located in Uasin Gishu County of the Rift Valley Province of Kenya. The participants of the study included both male 30 (71.4%) and female 12 (28.6%) as respondents. Most of the respondents were degree holders who included; school principals and their deputies, Heads of Departments (HODs) and Boards of Governors (BOG) members. With regard to their academic credentials, all of them were literate and suitably qualified for their roles in school management. A total of 3(50%) day and 3(50%) boarding secondary schools were sampled for the study.

Adoption and Use of ICT in Performing Management Functions: The study also sought to find out from the respondents if there was any significant difference in ICT adoption and use when performing management functions between day and boarding schools. The findings indicated that most of the day schools used both traditional and modern ICT related aspects in performing management functions but a slight difference was observed where more boarding schools seemed to adopt and use modern ICT as compared to day secondary schools as shown in table 1.

Table 1.Type of school and ICT classification Cross tabulation

		ICT classification			Total
		Traditional	Modern	Both	
Type of school	Day	10	3	7	20
	Boarding	3	10	9	22
Total		**13**	**13**	**16**	**42**

The results imply that more boarding secondary schools had embraced modern ICT in the performance of management functions as compared to day schools. The study also established that the level of adoption and use of ICT in Wareng District schools was limited in as far as performing management functions was concerned, as compared to performing other functions such as typing examinations and other secretarial duties.

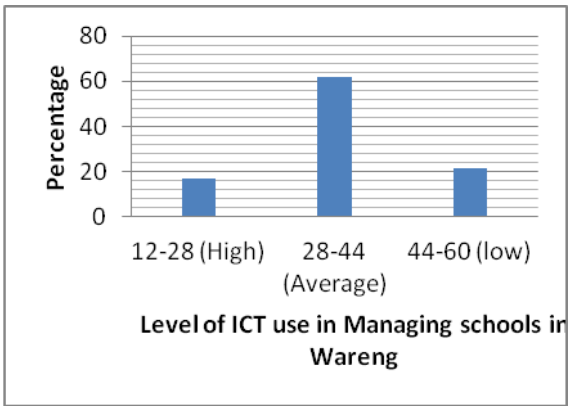
Uses of ICT in Secondary Schools: Respondents were asked to indicate ways in which ICT was applied in the performance of management functions in their respective schools. Most 26(61.9%) of the respondents indicated that they used ICT in storage of school records 20 (47.62%) on timetabling, 20(47.6%) on communication, 18 (42.9%) on secretarial duties as shown in table 2.

Table 2 Uses of ICT In schools

TASKS/ICT APPLICATION	Freq	%
Storage of all records	26	61.9
Timetabling	20	47.62
Communication	20	47.6
Secretarial Work e.g. typing	18	42.9
Academic Results analysis	13	31.0
Financial accounting Analysis	12	28.6
Internet	11	26.2
PowerPoint presentation in meetings	1	2.4

The findings show that ICT is mostly used for record storage purposes, timetabling, communication and secretarial work E.G typing examinations and staff meeting minutes in that order. Analysis of both academic results and financial accounting, use of internet and power point presentations recorded very low ratings. The level of ICT use was scored on a scale of 12 to 60 with those closer to 12 on the scale performing better in ICT adoption and use. It was observed that on the whole, the adoption and use of ICT in Wareng schools was average with a mean of 37.214 and a standard deviation of 8.14 with the respondents score ranging from 22 to 52. When the ICT usage score was grouped and categorized into low, average and high, it was observed that ICT adoption and use in schools in Wareng District was average as recorded in figure 2.

Figure 2 Level of ICT usage in Managing schools in Wareng District



This level of use indicates that although it is still on average, there is recognition that it is quite necessary and the schools management are willing and ready to adopt ICT if and when facilitated. The study also established that there was a difference in ICT adoption and use among day and boarding secondary schools within Wareng District. Results showed that boarding schools had adopted and used ICT for a longer period than day schools. Boarding schools had also better facilities with modern ICT as compared to day schools. This

is mainly because, most of the boarding schools are well established with good infrastructural facilities and have been in existence for a longer period as compared to day schools. This brings out the glaring disparities between day and boarding schools and therefore there is need to improve the adoption and use of ICT and provision of other necessary facilities in day secondary schools in Wareng District.

Benefits of Using ICT in Performing Management Functions: The respondents were asked to give their opinions regarding benefits of using ICT in performing management functions. The results indicate that ICT adoption and use had potential benefits in performing management functions in secondary schools. Fourty or 95.2% of the respondents indicated that ICT improves efficiency and effectiveness, 38 or 90.5 indicated that it improves accountability 90.5%, 37 or 88.1% said that it improves communication while 83.3% said that it improves data management. Other benefits that emanated from the study findings included the reduction of labour costs, make work easier and improve decision making as illustrated in table 3.

Table 3 Benefits of Using ICT in Performing Management Functions

Benefits	Freq	%
Improve effectiveness and efficiency	40	95.2
Improving accountability	38	90.5
Improving communication	37	88.1
Improving data management	35	83.3
Reducing labour costs	33	78.75
Makes work easier	30	71.4
Improving decision making	25	59.5

These results show that most of the respondents acknowledge the importance of using ICT in performing management functions in secondary schools. The results indicate that the benefits of using ICT in schools are undisputed. There was also general agreement that ICT has positive effect in school management as most respondents agreed with the statement that ICT; makes teaching more effective, makes lessons plans richer, helps in organizing professional tasks, helps in meeting varying needs of students and helps in smooth running of school operations.

Effects of Adopting and Using ICT in Secondary Schools: Results showed that most 71.4% of respondents agreed that ICT makes teaching more effective by making lesson plans richer, 64.3% of respondents also agreed with the statement that ICT helps in organising professional tasks with only 14.3% of respondents being undecided, 35.7% agreed that ICT helps to meet varying needs of students of which 26.2% disagreed with the statement, a significant 83.3% of respondents also agreed with the statement that ICT helps in smooth running of school operations. A test of the relationship between ICT use and the effect of ICT on school management shows a positive linear relationship ($r=0.324$, $R^2=0.105$, $\alpha=9.459$ and $\beta=0.324$) with a linear regression model:

Effect of ICT use in management = 9.459 + 0.324 level of ICT use.

This relationship is however weak since only 10.5% of the change in effects can be attributed to a unit change in ICT use. This means that a lot more has to be done in the adoption and use of ICT in carrying out managerial functions so that the effects and benefits are more pronounced.

In summary, most of the respondents agreed with the statement provided therein regarding the effects of adoption of ICT in secondary schools. The implication is that there was a general feeling among the respondents that ICT had a positive effect on school performance when adopted and used by the school management.

Table 4 Challenges of ICT use in Secondary Schools

Challenges	Frequency	%
Limited knowledge on how to make full use of ICT	40	95.2
Lack of financial support	40	95.2
Limited understanding on integrating ICT into management functions	39	92.9
Lack of technical support	37	88.1
Software unavailability	30	71.4
Lack of interest in using ICT	23	54.8
lack of time	20	47.6
Lack of computers	18	42.9
Limited personnel	15	35.7
Lack of electricity	12	28.6
Poor infrastructure	10	23.8
unregulated access to information on the internet	2	4.8

Conclusions and way Forward: The adoption and use of ICT in education has improved a great deal but the real impact is yet to be fully realized as in other fields. Education is a very socially oriented activity and quality education has traditionally been associated with strong teachers having high degrees of personal contact with learners, but for school performance to improve there is need to have an effective management that allows smooth and responsible running of schools.

The paper concludes though most of the schools in Wareng District have computers, the computers are rarely used to perform management functions. The study also established that schools within Wareng District have not fully embraced ICT in performing their management functions. The level of adoption and use of ICT in the performance of management functions is higher in boarding schools as compared to day schools.

The managers of schools do recognize that there are several benefits related to the adoption and use of ICT in their schools. However, those in management had not fully realised these benefits since the level of adoption and use of ICT at the management level is still low.

The study also established that there are several challenges that face the schools management in the use of ICT in school management, with the key challenge being lack of technical skills to integrate ICT in management. These challenges may be the reason why most schools in Wareng District have not

fully embraced ICT adoption and use in school management. They include: lack of technical support, lack of financial support, inadequate facilities, lack of ICT related software and hardware to perform the management functions and limited knowledge on how to integrate ICT into management functions. This has resulted to most schools sticking to traditional ways of performing management tasks which has currently been improved by technological innovations.

Finally, there is need for the school management and all stakeholders in the education sector to ensure that ICT is fully adopted and used in management of public secondary schools in order for the schools to enjoy the benefits associated to ICT use in schools. Therefore, school managers should be trained to ensure that they have the right skills to perform the management functions using ICT.

Recommendations: Following the study findings, it is clear that ICT is important and beneficial in performing management functions in secondary schools. In order to improve performance, there is need for the school management to adopt and use new technologies at all levels of their operations. To do this, the paper recommends the following:-

1. Training of school managers on the use of computers – the ministry of education in conjunction with other stakeholders should organize in-service course for all teacher/managers in secondary schools and especially those in management positions.
2. Provision of electricity to schools – through rural electrification programme the government should prioritize school electrification programmes so that all schools can enjoy the benefits of ICT.
3. The Kenyan government should post computer technicians to schools- the government should post computer technicians to all schools to aid in the maintenance of ICT appliances.
4. Provision of ICT appliances to schools – the government should establish ways of providing computers to schools and their application software's.

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Satisfactory Learning Opportunities for 'multi-sensory learning' with Educational Software Systems

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Abstract

A number of studies have concluded that one of the best approaches to accelerate the learning process is to apply a 'multi-sensory' learning approach in which learners are provided with as many different learning styles as possible, facilitating the flow of information to the learners' brains simultaneously and holistically. This process can be aided by the use of educational software. This paper attempts to identify an education software system that truly supports a 'multi-sensory' learning approach. Different multimedia/interactive features embedded within educational software can be designed to stimulate different learning styles. From a review of the literature, a number of multimedia/interactive features that stimulate learning styles have been identified in educational software systems. To adequately cover and facilitate the understanding of the roles of these multimedia/interactive features in stimulating learning styles, two architecture models of the human brain, namely the 'Split-Brain' and 'Multiple Intelligences' models, have been utilized in this paper. A survey based on a number of studies in educational software concluded that the Computer Based Training (CBT) Software System and the Mind Mapping (MM) System have been found to stand out above the others in their ability to design and apply a diverse range of multimedia/interactive features, thereby enabling learners to engage in a variety of learning styles. The survey also reveals that one or more multimedia/interactive features that were found to be applicable in one system were found to be not applicable in the other. Further investigation into those multimedia/interactive features that were found to be non applicable in either one or the other system, was conducted. It was found that these features play a significant role in stimulating certain learning styles and hence this paper concludes that neither CBT nor MM software systems have the capability to accommodate a truly 'multi-sensory' learning methodology.

Keywords

Multiple Intelligences, Split-Brain, Computer Based Training, Mind Mapping, Multi-sensory learning

1. INTRODUCTION

A number of studies have concluded that one of the best approaches to accelerate the learning process is to apply a 'multi-sensory' learning approach, in which learners are provided with as many different learning styles as possible, facilitating the flow of information to the learners' brains simultaneously and holistically. This approach is aided by the use of educational software (Chen & Chang 2000; Franco 2007; Good 2003; Kay 2001; McKenzie 2002).

This paper attempts to answer the question: Are there any educational software systems that satisfactory provide 'multi-sensory' learning opportunities? Data required to answer this question has been compiled from the exploration of 41 publications, retrieved from various sources.

Multimedia/interactive features built-in within most educational software systems can stimulate one or more learning styles, thereby providing learners with a heightened and more satisfying learning experience (Chen & Chang 2000; Franco 2007; Good 2003; Kay 2001; McKenzie 2002). From the 41 publications reviewed, all possible multimedia/interactive features that can be designed and applied to educational software systems have been identified.

To adequately cover and facilitate the understanding of the roles of these multimedia/interactive features in stimulating learning styles, two architecture models of the human brain have been selected:

- The first model is: 'Split-Brain' theory, devised by Sperry (1982) in which he uncovered the different roles of each side of the human brain and where he concluded that there are two major learning styles, each corresponding to one hemisphere of the brain.
- The second model is: 'Multiple Intelligences' by Gardner (1983) in which he proposed a set of seven different learning styles, processed through different areas of the brain.

Two education software systems, namely: CBT and MM software systems have been found to be able to be programmed to implement a vast variety of multimedia/interactive features. However, one or more of

the available multimedia/interactive features that were found capable of being programmed into one system were found to be not capable in the other.

Accordingly, multimedia/interactive features can be categorised into three groups:

Group 01: Multimedia/interactive features that can be implemented in both CBT and MM software packages;
Group 02: Multimedia/interactive features that can be implemented only in CBT software packages; and
Group 03: Multimedia/interactive features that can be implemented only in MM software packages.

Further investigation into these multimedia/interactive features that were found to be non applicable in one or the other system (i.e. Groups 02 and 03) was conducted. It was found that these features play a significant role in stimulating certain learning styles and hence this paper concludes that neither CBT nor MM software systems have the capability to accommodate a truly 'multi-sensory' learning methodology.

The rest of this paper is organized as follows: In Section 2, we will explore the background theories behind the two sets of learning styles introduced by Sperry (1982) and Gardner (1983) in more detail. Section 3 is dedicated to the discussion of CBT and MM software systems and their relationships with the various learning styles. Numerical data required to establish the relationship between learning styles and multimedia/interactive features employed within CBT and MM software systems in detail was extracted from 41 publications. The presentation of this data concludes Section 3. Finally in Section 4, the analysis on the findings in Section 3, as well as the conclusions and limitations of this paper are presented.

2. BACKGROUND ON LEARNING STYLES

Over the last 30 years, researchers have unearthed a treasure trove of knowledge concerning how the human mind works, how the human brain is structured and functions, and how people learn (Levine 2001, as cited in Kay 2001; Smith 2004). Discoveries in human brain anatomy and their implications for areas such as learning, have gained much momentum, with the US Congress designating the 1990's as the "Decade of the Brain," (Bush 1990). During this period a number of models of human brain architecture were proposed to aid the explorations and interpretations of the different aspects of the brain (Smith 2004). Unlike a vast majority of the literature, which utilized one of the human brain architecture learning model to explain the role of intelligence and learning styles and to present their respective arguments, this paper utilizes two learning models, namely 'Split-Brain' (Sperry 1982) and 'Multiple Intelligences' (Gardner 1983) models.

Sperry's Split-Brain Theory

Sperry's (1982) research established that the brain is divided into two major parts - the right and left brain, and that each hemisphere of the brain specializes in its own style of thinking and has different capabilities. Accordingly, people can be categorized as being either left brain dominant or right brain dominant.

Table 1: Left Brain and Right Brain functioning.

General category	LEFT Hemisphere	RIGHT Hemisphere
linguistic/visual	words and language	symbols and images
	speaking	visual-pictorial
logic	uses logic	uses feeling
	math & science	philosophy, religion & music
orientation	detail oriented	"big picture" oriented
	linear	Nonlinear
	sequential	Simultaneous
perception	order/pattern perception	spatial perception
	pattern user	pattern seeker
	black and white	Colour
way of thinking	reality based	fantasy based
	propositional	Imaginative
	apply rule	apply creativity
knowing	knowing	believing
	knows object name	knows object function
Action	forms strategies	presents possibilities
	practical	Impetuous
	safe	risk taking
	present and past	present and future
Neurotransmitters	higher levels of norepinephrine	higher levels of dopamine
Grey/White Matter ratio	more white-matter (longer axons)	more grey-matter (cell bodies)
Shared	Sensations on both side of face, sound perceived by both ears, pain, hunger	

Note: Information within is extracted from the Courier Mail (2008 February), the Daily Telegraph (2007 October), Eden (2008), Morris (2008), OEDC (2009), Pitek (1998), Sankaran (2009) and Sperry (1982).

The Left Brain: The left brain is better with verbal, logical, and analytical thinking. It excels in naming and categorizing things, symbolic abstraction, speech, reading, writing, and arithmetic. It is associated with thinking and learning in a logical sequence, or stepwise fashion. (Mann 2005) Left brain dominant people are good at focusing on individual components, attending to details and solving problems in a methodical, serial-ordered manner. They learn best by exploring things sequentially. They see the trees instead of the forest (Critcher & Ferguson 2010).

The Right Brain: The right brain processes information differently to the left brain. It has been associated with the realm of creativity. It functions best in a non-verbal way,

excelling in visual, spatial, perceptual and intuitive information. It flourishes in dealing with complexity, ambiguity and paradox. For right brain dominant people, processing happens very quickly and holistically, and the style of processing is non-linear and non-sequential. At times, they experience difficulty putting concepts into words because of their ability to process complex and non-verbal information quickly (Mann 2005; Pitek 1998). They are not concerned with things falling into patterns because of prescribed rules. They tend to emphasize the importance of the whole and quickly seek to determine the spatial relationships of all the parts as they relate to the whole. They see the forest instead of the trees. They are able to see the big picture (Critcher & Ferguson 2010).

Since the inception of split-brain theory by Sperry (1982), there have been a number of discoveries confirming that each side of the brain provides specific ways of interpreting information and reacting to situations. A summary of these discoveries has been compiled and presented in Table 1.

Gardner's Multiple Intelligences (MI) Theory:

The theory of multiple intelligences was introduced by Gardner (1983) to more accurately define the concept of human intelligence. It quickly became established as a classical model to understand and teach many aspects of human intelligence, learning styles, as well as explain personality and behaviour, both in education and in industry. Gardner initially developed his ideas and theories as a contribution to psychology; however Gardner's theory was soon embraced by education, teaching and training communities, a sign that he had created a classic reference work and learning model (Chapman 2003).

Gardner (1983) originally proposed a list of seven intelligences. Briefly, the first two, which include linguistic and logical-mathematical intelligence, have been typically valued in schools; the next three, which include musical and bodily-kinesthetic intelligence, are usually associated with the arts. The final two, which include interpersonal and intrapersonal intelligence, are what Howard Gardner called 'personal intelligences.' The following are descriptions of Gardner's multiple intelligences, compiled from Gardner (1983), Smith (2004) and Richard (2009).

Intelligences that have been typically valued in schools:

1. Linguistic intelligence: involves sensitivity to spoken and written language, the ability to learn languages, retention, interpretation and explanation of ideas and information via language and the capacity to use language to accomplish certain goals. This intelligence includes the ability to effectively use language to express oneself rhetorically or poetically; and use language as a means to remember information.

2. Logical-mathematical intelligence: consists of the capacity to analyze problems logically, carry out mathematical operations, understand the relationship between cause and effect towards a tangible outcome or result, and investigate issues scientifically. It entails the ability to detect patterns, reason deductively and think logically. This intelligence is most often associated with scientific and mathematical thinking.

Intelligences usually associated with the arts:

3. Spatial/Visual intelligence: involves the potential to recognize and use the patterns of wide space and more confined areas. It consists in the ability to interpret and create visual images, imagine and express concepts pictorially, and understand relationships between images and meanings; as well as between space and objects.

4. Bodily-Kinesthetic intelligence: entails having the innate ability to use one's whole body, or parts of the body, to solve problems. It is the ability to use mental abilities to coordinate bodily movements. This type of intelligence is associated with manual dexterity, physical agility and balance; as well as eye and body coordination.

5. Musical intelligence: involves skills in the performance, composition, and appreciation of musical patterns and sound. It encompasses the capacity to recognize and compose musical pitches, tones, and rhythms, as well as to understand the relationship between sound and feeling.

Intelligences usually associated with individual personality:

6. Interpersonal intelligence: is concerned with the capacity to understand the intentions, motivations and desires of other people. It allows people to work effectively with others. It also encompasses the ability to relate to others; interpret behaviour and communications; and understand the relationships between people and their situations.

7. Intrapersonal intelligence (self-reflection, self-discovery): entails the capacity to understand oneself, to appreciate one's feelings, fears and motivations. It involves having an effective working psychological model of ourselves, and being able to use such information to regulate our lives. It is also related to personal cognizance and personal objectivity - the capability to understand oneself, one's relationship to others and the world; and one's own need for, and reaction to change.

When the theory of multiple intelligences was conceptualized, Gardner (1983) added:

> While each of these intelligences has its own distinct characteristics, the whole intelligence apparatus act in consort and are not mutually exclusive. They also overlap one another. Everyone has all the intelligences. The strength of a particular intelligence varies from person to another, and one can strengthen an intelligence type.

Since Gardner (1983) devised these seven intelligences, there has been a great deal of discussion as to other possible candidates for inclusion. Subsequent research and reflection by Gardner and his colleagues have looked into three particular possibilities: a naturalist intelligence, a spiritual intelligence and an existential intelligence. Gardner (1999, as cited in Smith 2004) concluded that the first of these "merits addition to the list of the original seven intelligences." However, these final additions to Gardner's Multiple Intelligences model have been omitted in this paper as they are not applicable to the subject matter being discussed.

'Multi-sensory Learning' Approach:

Although Sperry (1982) and Gardner (1983) proposed their corresponding sets of learning styles independently, there are some commonalities within their arguments. One of them is that each area of the brain is associated with greater efficiency in learning and solving specific tasks, and that the most effective problem-solving and learning strategy is to take advantage of the best that each and every area of the brain can offer by allowing all areas of the brain to engage simultaneously (Schmeck 1988, as cited in Liu & Ginthe 1999). In other words, if the whole brain is engaged in learning, the learning process is dramatically accelerated (Lozanov 1978; Good 2003).

Gardner (1982) referred to this learning approach as 'multiple chance theory of education.' Depending on the circumstances, others referred to this approach of learning as 'whole brain learning', 'whole brain thinking', 'multi-channels learning,' 'multi-sensory learning,' 'global learning' or 'holistic learning,' and this approach is recommended by a number of experts from both the academic (e.g. Carlson-Pickering 1999a; Gardner 1982; Clayton & Kimbrell 2007; Goldberg 2004; Mills 2001) and commercial (e.g. Chapman 2003; Morris 2008; 2004; Rose 1985) worlds, as well as other interest groups. (e.g. OEDC 2009; Sankaran 2009; Sicinski 2008).

'Multi-sensory Learning' approach is aided by the use of educational software as strong relationships exist between multimedia/interactive features embedded within educational software and learning styles (Chen & Chang 2000). According to Franco (2003), this relationship is "far too strong to go completely unnoticed." McKenzie (2002) agrees, stating that "… there are surefire types of instructional technology that accommodate specific learning styles." Sword (2000) also concurs, adding: "each technological medium corresponds to one or more human intelligence path ways or learning styles which act as passage for delivering information to the human brain."

3. CBT AND MM SOFTWARE SYSTEMS AND LEARNING THEORIES

Perception of learning styles has altered radically in the past 25 years (Microsoft Learning Suite 2010). New approaches, such as the whole brain learning methodology described in Section 2, have highlighted new ways of advancing creativity and understanding across most education software technologies (Chen & Chang 2000).

Data acquired in this paper is extracted from the exploration of 41 publications, retrieved from a cross-section of available sources. The vast majority of the literature describe the relationship between learning styles and multimedia/interactive features such as text, images, color, audio and video as commonly employed by a range of software applications, including software applications such as word processing, spreadsheets etc. Although it was noted that software applications such as word processing, spreadsheets etc. were identified as having the ability to stimulate certain learning styles (McKenzie 2002), the level of stimulation was found to be minimal. Presentation software such as Microsoft PowerPoint, which has been designed for use as an educational tool, in terms of its ability to stimulate learning styles, cannot be considered to be a highly valuable instrument for learning (Good 2003). The study by Kurtus (2006) concurs with this assessment and recommends that one should only consider using such presentation software at the "basic" or "simplest" level, largely due to the 'linear' nature of its presentation format. He (2006) suggested that for developing higher level of education packages, CBT software packages should be utilized as they are specifically designed for that purpose.

Computer Based Training (CBT) Software Systems

CBT, also commonly referred to as 'computer assisted instruction', 'computer assisted learning', 'distance learning', and 'technology based training' (Henke 2001) or eLearning (Education Resources 2006; Franco 2007) refers to any course of instruction whose primary means of delivery is via a computer software system. CBT has existed for over four decades, but was not widely used until the advent of the personal computer (Mills 2001). CBT software supports multiple learning styles (Microsoft Learning Suite 2010) and is a fast-growing field (Henke 2001). CBT software is embedded with rich multimedia/interactive features that can help to create a rich and engaging learning environment that enables students to unlock their talents and realize their full potential (McKenzie 2002). CBT can deliver many kinds of courses in many companies, institutions and international organizations around the world (Good 2003).

Schaller (2005) recommended that, in designing a CBT software system the programmer should create a system that provides an engaging environment and effective experience for a wide variety of learners. To create a system with such capability, the designer should strive to achieve an understanding of individual differences in learning styles in order to provide valuable insights into the specific elements required.

Mind Mapping (MM) Software Systems

When Tony Buzan initially popularized the idea of Mind Mapping in 1974, he delineated 'accelerated learning' to be one of the main advantages of utilizing this system (Buzan 1993). Users, particularly visual spatial learners, can use Mind Mapping as an illustrative tool to assist them in managing thoughts, directing learning and making relational connections (Strauss 2006). The visual spatial learning style is associated with right brain activities under Sperry's Split Brain theory paradigm (1982) and visual intelligence under Gardner's Multiple Intelligences Theory paradigm (1983). A Mind Map is a construct of a series of visual images or key words that, in its totality, form a larger visual image (Carlson-Pickering 1999a). Physically, a mind map is a visual diagram with lines and nodes representing ideas and relationships between them. The core idea sits in the middle, with related topics branching out from it. The coloured keywords, images or symbols representing ideas are further broken down and extended until the page looks like an impressionist painting of a spider colony (Codswallop 2007).

Relationship between Learning Styles and CBT and MM Software Systems

Franco (2007), Chen & Chang (2000) and McKenzie (2002) have suggested that the best way of determining the strengths of an educational software application is to conduct an inventory of the multimedia/interactive features utilized in the software and then to analyze the degree of simulation they have upon each intelligence or learning style as described in Section 2. In order to identify an educational software system that truly supports a 'multi-sensory learning' approach, the main aim of this paper, 41 publications have been investigated. The data presented in Figure 1 and Table 2 represents a summary representation of this investigation. Figure 1 presents a bird's eye view of an inventory of the multimedia/interactive features utilized in the educational software systems and the applicability of these features in CBT and MM software systems.

From Figure 1 we can conclude that:

1. both CBT and MM software systems can be designed and implemented with a large number of these multimedia/interactive features, but not with all of the features; and
2. one or more multimedia/interactive features that can be implemented in CBT software packages cannot be implemented in MM, and vice versa.

Accordingly, multimedia/interactive features are categorised into three groups:

Group 01: Multimedia/interactive features that can be implemented in both CBT and MM software systems;
Group 02: Multimedia/ interactive features that can be implemented only in CBT software systems; and
Group 03: Multimedia/interactive features that can be implemented only in MM software systems.

Numerically, Figure 1 can be summarized as follows:

- There are 17 possible multimedia/interactive features that can be designed and implemented in educational software systems;
- 14 (or a vast majority) of these multimedia/interactive features can be implemented in both CBT and MM software packages. This group is referred to as Group 01.
- Out of the remaining three multimedia/interactive features, two were found to be capable of being implemented in CBT, but not in MM systems. This group includes the ability to (1) allow the user to learn at his or her own pace; and (2) provide the user with an interactive practice session. These are referred to as Group 02.
- The remaining feature (Group 03) is found to be capable of being implemented in MM, but not CBT. This group includes the 'zoom in/out' capability. In zoom-out mode, users have the opportunity to examine all the learning materials in a single bird's eye view. From zoom-out mode, users can then navigate and zoom into any particular section and learn the material in detail.
- The combination of CBT and MM software system covers all 17 possible multimedia/interactive features.

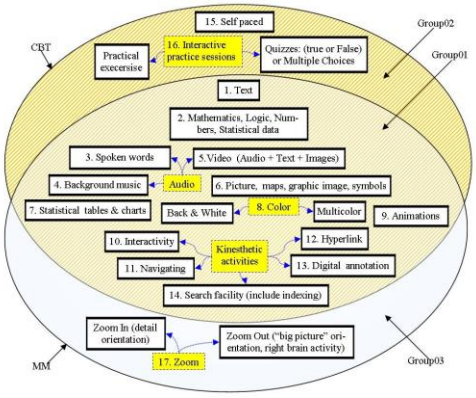

Figure 1: Multimedia and Interactive features applicable in CBT and MM

Table 2 illustrates the relationship between the multimedia/interactive features applicable in educational software systems and the learning styles proposed by Sperry (1982) and Gardner (1983) as described earlier. Note that the numbers specified at the intersections between multimedia/interactive features and corresponding learning styles, represent the number of publications that have been found to agree with the assertion that there is a relationship between each particular multimedia/interactive feature and the corresponding learning styles. For example number '22' appearing at the intersection between 'Text' and 'Linguistic', refers to the 22 publications that have been found to be in agreement with the idea that there is a relationship between the multimedia/interactive features 'Text' and 'Linguistic' learning styles.

From Table 2, we can observe that:

1. in some multimedia/interactive features such as 'text' or 'spoken words', a relationship exists between the particular multimedia/interactive features and those learning styles derived from either of the brain architecture models; and
2. in others, a relationship exists between the particular multimedia/interactive features and certain learning styles derived from only one of the brain architecture models, but not from both.

For example, it was found that in the case of multimedia/interactive features such as 'Animations' or 'Self pace', a relationship exists between the particular multimedia/interactive features and learning styles derived from the 'Multiple intelligences' model but not from 'Split brain' model.

On the other hand, in the case of multimedia/interactive features such as 'Zoom', it was found that a relationship exists between the particular multimedia/interactive features and learning styles derived from the 'Split brain' model, but not from 'Multiple intelligences' model.

This helps to explain the need to utilize the two brain architecture models in this paper.

Table 2: Relationship between multimedia/interactive features applicable in educational software programs and learning styles

			The Two Brain Models								
			Multiple Intelligences Theory							Split Brain Theory	
			Linguistic	Logical-mathematical	Spatial/Visual	Bodily/Kinesthetic	Musical / Rhythm	Interpersonal	Intrapersonal	Left hemisphere	Right hemisphere
Multimedia/Interactive features applicable in Educational Software	1. Text		22							15	
	2. Mathematics, Logic, Statistical			16	1					11	
	Audio	3. Spoken words	13							8	
		4. Background music					9				8
	5. Video (Audio, Text, Images)		6		10		2			3	3
	6. Picture, Maps, Image, Symbols			2	15						17
	7. Statistical tables and charts			3	14						5
	8. Color	black and white			5					1	4
		Multi-color									
	9. Animations				6	2					
	Kinesthetic activities	10. Interactivity			1	4			1		
		11. Navigating within			2	3			1		1
		12. Hyperlink				4			1		
		13. Digital annotation	1			4					
		14. Search facility	1		1	3					
	15. Self Pace		1			2			10		
	16. Interactive Practice Sessions		2	1	1	3			5	1	
	17. Zoom	Zoom-in (detail)								8	
		Zoom-Out (big picture)									16

4. ANALYSIS, CONCLUSION AND LIMITATIONS

One of the findings in Section 2 was that in learning, one should not ignore the importance of applying a 'multi-sensory learning' methodology in order to provide learners with the maximum opportunity to engage with all their learning styles.

Given that:

- both CBT and MM software were found to be able to design and implement applications using a diverse variety of multimedia/interactive features that facilitate and enhance the flow of information to the user's brain simultaneously and holistically,

and that:

- one or more multimedia/interactive features present in one system were found to be absent in the other,

the question that arises then is: Do CBT or MM software systems provide satisfactory learning opportunities for 'multi-sensory learning' methodology?

The answer to this question can be ascertained through a detailed examination and assessment of the magnitude of importance of those multimedia/interactive features that were present in CBT, but absent in MM, and vice versa.

Multimedia/interactive features applicable in CBT, but not applicable in MM:

Self Pace: Intrapersonal intelligence-dominant people enjoy being left alone to solve their problems (Armstrong 1994). They get more out of being left alone when learning (Shiratuddin & Landoni 2000) and the self-paced CBT program therefore poses an excellent learning tool for this type of individual (Carlson-Pickering 1999a). The ability to allow learners to learn at their own pace, plan their own learning activities, monitor their progress and evaluate their own learning outcomes, is one of the most crucial advantages of CBT-style programs. CBT grants the learner independence and autonomy, as well as control over all aspects of their learning experience/process (Franco 2003). Versatile technologies, especially those that include the capacity to allow users to learn at their own pace and in their own time, such as those embedded within CBT, fit the multiple intelligences approach to education. The technological ability to allow learners to study at their own pace is referred to, in CBT, as 'personalized education' (Gardner 1997, as cited in Chen & Chang 2000).

Interactive Practice Session: Good (2003) delineated computer-delivered quizzes and practice sessions as one of the most effective activities that can be adopted in CBT, and argues that it favors linguistic and bodily-kinesthetic dominant types of learners. However in an attempt to explain intrapersonal intelligence, Shiratuddin & Landoni (2000) delineated, amongst other things, the provision of "drill and practice programs" as examples of activities that cater for intrapersonal intelligence. Rose (1992, as cited in Laughlin 1999) argued that one of the techniques used to accelerate the learning process is to provide practice sessions as soon as the material has been studied, stating that hands-on practical experience stimulates students' kinesthetic intelligence. McKenzie (2002) suggested that providing practice sessions post study should be integrated into instructional technology so thoroughly that they become a vital piece in the learning process, enabling students to move from theory to practice more easily.

Multimedia/interactive features applicable in MM, but not applicable in CBT:

Zoom-in/out capability: Although the MM software system has other usages beyond that of education, this feature is one of its major features and it is not present in any other educational software systems. It allows learners to put together all the learning material on one page or one computer display, enabling them to easily see relationships between elements, as well as the big picture (Goldberg 2004). The right side of the human brain is the more big-picture-oriented, whilst the left is more detail-oriented. The zoom out mode in MM software immediately activates the user's right brain functions, allowing the user to get an overview of what he or she is learning. It also acts as an interface that allows the user to then look into the detail of individual learning components, as he or she shifts from zoom-out to zoom-in mode (Carlson-Pickering 1999a; Sankaran 2009; Eden 2008). The ability to zoom in and out is particularly beneficial for right brain-oriented people who are able, and prefer to, see the big picture first before breaking this down as they zoom in to see individual parts in more detail (Critcher & Ferguson 2010; Morris 2008).

Sicinski (2008) pointed out that MM software systems provide learners with the ability to zoom in and out, and view the information as they wish. Because the learner can quickly and easily switch from a local to a global perspective, and vice versa, to view information from a multitude of zoom-levels and angles, the learner can see all

the interconnected pieces interacting with each other in multiple ways. When zooming in, learners have the opportunity to read and examine the information in a linear and sequential manner, allowing the learner to engage his or her linguistic and logical intelligences under Gardner's Multiple Intelligences model (1983) or left brain under Sperry's split brain learning model. (1982) On the other hand, when zooming out in MM programs, learners have the opportunity to view all relevant information together on a single view or page. Presenting information in big pictorial images allows the right brain to activate and helps people to assemble/grasp the information quickly. (Carlson-Pickering 1999a) Frey & Fisher (2008) concur, saying that users learn easier and faster when they can see all the information in one large Mind Map (MM) image.

Furthermore, human beings by nature think, dream and predominantly imagine the world in visual images. As a result, MM, as a large visual image, can help to improve a learner's photographic memory. Chunks of information are difficult to understand because learners can't see these chunks from a global perspective. Many times, learners get lost within the details and fail to see the larger picture. Books or classroom lectures tend to present information in a linear and sequential manner, with very little interlocking between topics, thus making it more difficult to fully comprehend and absorb the material (Sicinski 2008).

From a different prospective, Jobson (2003, as cited in Goldberg 2004) observed that when learners are presented with written material, they go straight to a very linear model of thinking. However when learners are presented with learning materials in an MM format, they allow themselves to use as many senses as they possibly can to process their learning. Sicinski (2008) agrees saying that, "Mind Mapping is one of many tools that are critical for accelerated learning," and suggesting that one should study Gardner's Multiple Intelligences theory to help understand how the process of learning can be accelerated.

Carlson-Pickering (1999b) also agrees with the observation presented above, asserting that the nature and structure of MM allows learners to tap into several of their intelligences simultaneously. Furthermore, she suggests that:

- logical and kinaesthetic intelligence is evoked during the creation and navigation of the MM;
- verbal intelligence is stimulated when written text is involved; and
- visual and spatial intelligence is activated by any color and/or images included. (According to Pitek (1998), color text or images are associated with the right brain activities.)

There is enough evidence to suggest that those multimedia/interactive features that were present in CBT, but absent in MM programs, and vice versa, do play a significant role in stimulating certain learning pathways. In conclusion, therefore, neither CBT nor MM software systems on their own have the ability to provide learners with a truly 'multi-sensory' learning capability.

This paper is limited to the discussion of learning styles and related issues. Other issues surrounding educational software systems like CBT and MM software, such as cost saving, time saving and increased motivation are not discussed in this paper. Ability to distribute educational software system over the web has its own advantages and disadvantages and can be classified as one of the multimedia/interactive features. However, since it has no relationship to learning styles, this feature has been omitted in the discussion of this paper.

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Summary of an experience of designing, carrying out and managing a Learning Management System

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Extended Abstract

The paper presents our team's almost 15-year-long research experience on LMS design, implementation and management. Every software system requires a so-called "business model". In other words, every software system requires the presence of a model of how to perform the activities which that model aims to promote. In the case of an LMS the model below pertains to how a certain system hypothesizes that the teaching activities of an educational organization are performed. Therefore the use of a system imposes limits on how the task for which the LMS is designed will be conducted.

The system that is analyzed in this contribution was developed at university for blended teaching some 15 years ago. In the year 1999-2000 the Faculty of Economics at the University of Trento decided to take up a software system enhancing its traditional educational activities by means of a web-based extension. It aimed to structure coherently the personal initiative taken by teachers who had activated autonomous web pages related to their courses. A Learning Management System was necessary to achieve this goal, i.e. software being able to manage as a whole the distance teaching that was put beside the academic courses. The Faculty was presented with three options: purchasing commercial software, using free software or building its own platform. The decision to build its own platform was a consequence of various reasons which we can summarize as follows. The use of commercial software would have been possible at too high a cost (acquisition, maintenance, management and training) when compared to budget limits. On the other hand free software was at that stage rather rudimentary.

After the first 5-year trial conducted on the *Corsi Online* (online courses) system, our team focused on carrying out a platform based on the structure of the learning virtual communities. According to our interpretation, a Virtual Community is not the result of a process of social networking. In fact, it is a virtual space shared by groups of people who have a common goal. A community's virtual space can be simple or complex; for example it can contain further virtual communities, thus establishing a hierarchical "father-son" relationship. The (virtual) community can be an open space accessible to anyone. However it can also be a restricted space, the access to which is reserved only for some people authorized by the community administrator. The users can have different roles with rights and duties which vary in the use of space and CMC services activated in a virtual community. The system maintains the consistency of the whole social environment of the virtual communities which are active at a given time, in that it provides users of a community with a range of on-demand services that can be activated and used in accordance with the permissions granted and the roles assigned.

The trial period convinced us to change the metaphor: these are some observation:

- Models of teaching / learning (such as learning by problems, learning by projects, cooperative learning and their combinations) can hardly be connected to the *e-Course*, especially when the software directly represents the metaphor of traditional courses;
- The needs for cooperation within the academic environments is extending to all the activities that constitute the context in which didactic takes place;
- The organizational didactic scenario is changing under the effects of new regulations or decisions made by academic institutions, and these changes will inevitably reflect on the LMS functionalities. It is important to note that these types of changes are usually the result of a debate process in which both elements of cooperation and negotiation interact;
- The didactics of an university are not built only as a set of studies and tests, but these activities are inevitably intertwined with the university's organization and its information system;

- In an academic context, not everything concerning teaching: for example, the entire faculty is more than a container of degree courses and a degree course is more than a container of lessons.

To answer these (and others) needs it was necessary to find another founding metaphor, which had at least three basic characteristics: to be general, suitable to support the cooperation processes and capable of modelling in an adequate way the organizational realities of an educational institution. This metaphor was found in the concept of virtual community. The system that arose, called *Online Communities*, was born in 2003 and runs in February 2005. It is still the platform in use at the Faculty of Economics and at other Faculties of our university.

The complexity of managing virtual communities is objectively quite different from that of a course. It requires a different approach also in the management of roles and permissions. There is an ever increasing need to provide, in the logics of integrating systems, a single moment of aggregation of the various services in order to enable subjects and systems with different interests (if they are not divergent) to access the same object, acting according to their own competences.
The architecture of Online Communities is based on five fundamental entities: *Person*, *Community*, *Role* and *Permission*. The combination of the roles and permissions defines the *Profile* for each user. The objective of the current version of Online Communities system was to create a collaboration space for people connected to the web, where it could be possible to widen the virtual space for relationships among the actors. The system is built around the metaphor of "virtual community". The main characteristics of a community could be summed up as follows:

- Each Community avails itself of a certain number of services.
- The services are general applications that enable the users to communicate in synchronous and asynchronous way, to publish contents, to exchange files, to coordinate events, etc.
- The potential services of a community are activated by a manager of the community according to the needs, and the users of a community can use them with different rights and duties.
- The communities can be aggregated into larger communities with hierarchic mechanisms and infinite nesting levels.
- The communities can be aggregated in an arbitrary way into larger communities disregarding the possible position of a hierarchical structure.
- All users are recognized.

Over the last few years the system has evolved into a platform for professional training orientated to LLL outside academia. The new implementation of the system has retained certain basic features of earlier versions, while also extending its functions in order to allow business models which are typical of training within the company. Such evolution has brought about the need to develop previously neglected aspects, especially with the aim of controlling the students' activities more extensively.
The first deals with the connection between the development of the software and its applications. Our goal is to show the need to evolve from the unspecific idea of an LMS as a general purpose platform of an unspecified educational institution. On the contrary, what should be highlighted is that such an effective technological tool should embrace the (social and technological) context where teaching and learning take place. This idea originates from the fact that the context of use should determine thextende services and instruments which the software should offer, not the other way round, as often happens.
The second aspect deals with the relation between LMS and more general information systems of educational institutions. At the moment e-Learning platforms seem to be built to act in a restricted circle made up of only teachers, tutors and students. Therefore, the community is a container ready for didactic processes, but not only: research teams, recreation groups, friends, secretariats, board of directors, colleagues, anything that could be an aggregation of people around a scope using virtual spaces on the web. The core of the application is composed by some abstract entities, i.e., Virtual Communities as aggregation of People to which some communication services are available in order to obtain certain objectives. In detail, a virtual community [7;8], is a space on the web dedicated to a collaboration objective, populated by people who communicate among each other, using a series of communication systems. With this approach, it could be possible to represent all the hierarchical relationships between different types of communities (such as Faculties, Didactic Paths, Master Degrees, Courses, etc.).
Online Communities had been experienced with a limited number of users since 2003, and was released early in 2005. As from 2005 it was used by the whole faculty of Economics of our University in all its components (students,

teachers, dean, secretaries, administrative staff, external partners) and others faculties are using the system in many courses. At present the system has more than 5.000 active communities, 16000 users and more than 2.5 million unique accesses since November 2005 (see Figure 1), with an increasing trend.

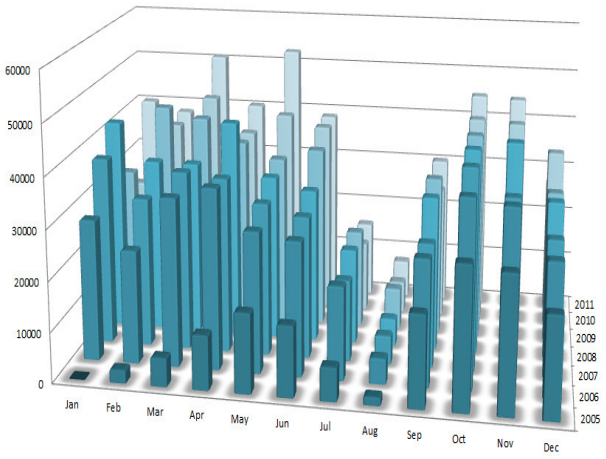

Figure 1. Online Communities access (19th december 2011)

The evolution that Online Communities is going through implies an increased implementation complexities respect to "simple" LMS settings, considering that the differences between the two approaches according at least four dimensions:

1. *Temporal*: the concept is amplified on larger spectrum, that is to say, the life of the subject, not necessarily dependent on schooling or university studies.
2. *social*: the platform could be used in social contexts of totally diverse life-long learning, even in conflict with each other. Let us take as example subjects who, while interested in continuous learning, change the country of their residence, company where they work, training needs, etc.
3. *spatial*: the place where the learner is conditions the modality of the supply of training iter and situated learning. Let us think, for instance, at the various learning needs of a person responsible for maintenance, or a medical doctor when facing an emergency case, or a tourist in front of a work of art in a museum.
4. *anthropological:* the subject uses the platform in completely different life periods; starting with pre-school age until the end of working activity and, not to be excluded, even beyond. The problems linked to these aspects represent something extremely stimulating and as yet unexplored, as it is clear (and first evidences are emerging) that our social and even mental behaviors are affected by technologies in general, and social media in particular.

Considering these observations linked to the approach of lifelong learning, meaning that, if the prospect of e-Learning offered by continuous training is extended on the temporal horizon, the architectural choices and the services supplied by the new platform are in need of complete re-engineering, in quantitative terms (dimension of personal space) as well as in organizational terms (services supplied, utility of management, updating and erasing, historical change of context, etc.); the changes must follow a careful analysis that takes into consideration various aspects:

- The system will operate on a territorial basis and in a context characterised by solid co-operation among the citizens.
- The system should be able to guarantee temporal continuity of the training experience which goes beyond the single case of training and ideally is extended to at least many years.

There is also another delicate problem be taken care of, that could be called "persistence of digital data"; reasoning along very long temporal scales, the moment a user utilizes several platforms in the course of his/her life, starting with compulsory school up to the last training activity in a working environment, a series of digital information will be stored inside very different systems:

- the unique identification of the subject through the different systems: this is particularly compelling, and is a hot topic today followed mainly in the Semantic Web field, with initiatives like OpenID (http://openid.net) or Okkam (http://www.okkam.org) projects
- the unique identification of the different systems and institutions where the subject followed teaching or collaboration activities: here we have the problem of mortality of educational institutions, that change name, site, mission etc.:
- the accounting system concerning the various taxes, enrolments, records etc.,
- the system of making public diploma or degree assignees, and in general the system of issuing certifications related with training
- Information concerning not only learning in the strictest sense, but intrinsically correlated to the learning environments consulted by the user during his/her career, that are a wide source of information.

QUIZ LOUNGE

Game-based learning on mobile devices

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***Abstract*—The Quiz Lounge project is a collaboration between Hochschule Darmstadt and Lufthansa AG. The goal of the project was the development of a mobile learning application. With the application, the Lufthansa managers should be able to learn about data privacy topics playfully and interactively. The application is based on a quiz concept and asks the user for answers to a series of ten questions which increase in difficulty level. While playing the game the user can use two "lifeline" helpers, the audience- and the 50-50-helper. Furthermore, the user has the ability to browse a glossary of related terms if he or she has the need of more detailed knowledge. New questions and also new games can be added with a web-based authoring tool. The authoring tool was uniquely developed for the Quiz Lounge application and conforms to the specific needs of its architecture.**

Education; e-learning; mobile learning; game-based learning; micro-learning; authoring tool; variable content; multiple mobile platforms

I. INTRODUCTION

The QUIZ LOUNGE app was developed in collaboration between the University of Applied Sciences, Darmstadt and Lufthansa AG, Frankfurt. Students from three departments (Computer Science, Media and Business) followed the goal to design an innovative system which would allow to develop a mobile learning app, present the content in a playful manner and thus meeting principles of game-based learning. As our target group included Lufthansa's management, we carefully interviewed the target group in order to find out where they would draw the line between „playful" and „childish" or "silly" and how they would like the content to be presented. A user-friendly interface was an understood feature. As our prototype was geared towards the content of "data privacy" and "data security", we faced the challenge of presenting a rather dry content in a motivating way. In order to enable Lufthansa to modify or add new content, we designed and uniquely developed a web-based authoring tool which enables users to modify the content of the app using a self-explanatory interface which converts the modifications into XML files read-in by the app dynamically.

II. THE GAME-BASED PRINCIPLE

During the decision process, of which type of game was most suitable for our application, we had to consider various aspects:

- the motivational factor,
- the topic to be taught,
- the fact that this app is to be used in parallel to other Computer Based Training Tools (CBTs) and
- that its primary use meets the German slogan "Leerzeiten zu Lehrzeiten machen" (translation: turn free time into educational units).

Game Based Learning is a variant of E-Learning. E-Learning is an umbrella term for electronically supported learning. Electronically supported learning in this context means software based learning using digital media and web technologies. E-Learning can be based on very different technologies and can be realized in different scenarios such as Computer Based Training, Learning Management Systems or Game Based Learning.

Game Based Learning refers to games that take place in a hard- and software-based virtual environment, so-called Digital Learning Games. Digital Learning Games should be fun, but their primary goal is to acquire knowledge and skills. Fun is to be used as a motivating factor for learning, by connecting the playful action with knowledge on certain topics.

When designing the app, we carefully investigated the game-based e-learning market as well as interviewed Lufthansa's management regarding their ideas of a mobile e-Learning app. We carefully had to find out where our target group would draw the line between "serious & playful" vs. "childish & silly", as the latter would have lead to an immediate failure.

Why did we consider the playful, game-based feature at all?

Marc Prensky, known as a developer of various educational games, is convinced that the huge success of computer games is the main argument for the introduction of Digital Learning Games [1]. The crucial factor for the success of Digital Learning Games is motivation. The reasons for more

motivation are clear. There is a new commitment to learning and the process of learning itself is interactive. According to Prensky, Digital Learning Games are used for:

- Material that is dry, technical and, yes, boring
- Subject matter that is really difficult
- Audiences that are hard to reach
- Difficult assessment and certification issues
- Complex process understanding
- Strategy development and communication.

Prensky also lists criteria that support the development of playful e-learning tools:

Games are a form of **fun**. That gives us ***enjoyment and pleasure***.
Games are a form of **play**. That gives us ***intense and passionate involvement.***
Games have **rules**. That gives us ***structure***
Games have **goals**. That gives us ***motivation***.
Games are **interactive**. That gives us ***doing***.
Games have **outcomes and feedback**. That gives us ***learning***.
Games are **adaptive**. That gives us ***flow***.
Games have **win states**. That gives us ***ego gratification***
Games have **conflict/competition/challenge/opposition**. That gives us ***adrenaline***.
Games have **problem solving**. That sparks our ***creativity***.
Games have **interaction**. That gives us ***social groups***.
Games have **representation and story**. That gives us ***emotion***.

Having confirmed that Digital Learning Games would suit our content and the listed criteria matched what our customer had in kind, we now needed to find out what type of game would be suitable for the content. Prensky suggested different learning activities for various types of content [1]. One of his categories is 'facts', which includes laws, policies and product specifications. Thus we were able to assign our topic of data privacy to this category.

Meier & Seufert [2] also categorize digital learning games (Fig.1). There are games that focus more on qualification and games that focus more on entertainment and fun. The quiz is categorized as a game type with a strong focus on qualification. Thus the game type quiz serves as acquisition of knowledge. However, by introduction of additional gaming elements the fun factor can be increased.

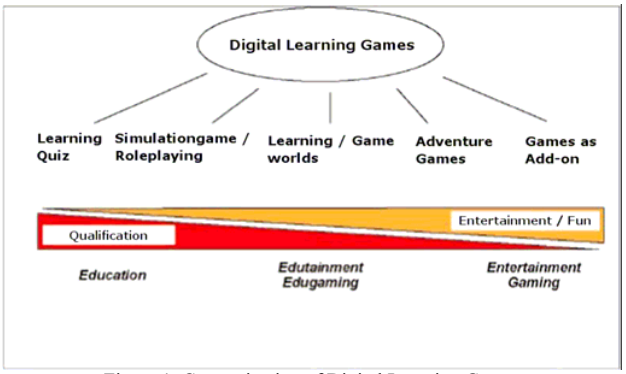

Figure 1: Categorization of Digital Learning Games

The criteria listed by Prensky and Meier & Seufert matched perfectly with the results of our interviews with the customers. Therefore, we decided to use a quiz format for the game. This is based upon the widespread use of quiz games around the world and also on their acceptance across ages. Furthermore, it gives us great flexibility with the content and a familiar learning environment, especially for short sessions, so-called "learning nuggets". Our QUIZ LOUNGE is based on the idea of "Who wants to be a millionaire?" (Fig.2), the internationally known and famous TV show.

Figure 2. Typical screen of the "Who wants to be a millionaire?" show (http://mobile-suite.ru/uploads/posts/2011-02/1297656273_rvqawc1uxusehli.jpeg)

Besides looking at the motivational aspect of a game-based app, we needed to take into consideration the time of development as well as the amount of data that needs to be presented, stored and processed on the mobile device. Educational video games, sometimes referred to as Edutainment, involve large amounts of data and were thus excluded from further plans for the design. Instead of attracting and convincing our users with fancy videos, we focused on an appealing design and textual data.

When designing the gaming idea of our app, we didn't want to reinvent the wheel. Instead, we looked at games that were not only successful with people in our target group but would also meet the needs of a rather fast implementation and a user-friendly end product.

III. THE DESIGN

During the design process for the different Blackberry devices (Lufthansa's management is presently equipped with Bold 9700 and Torch 9800), we faced several challenges imposed by the Blackberry itself. The Bold 9700 is held in portrait mode, the Torch in landscape mode (Fig.3).The fact that the Blackberry is a mobile device restricts the possibilities for the design of the application. The relatively small display shows the content in very high resolution, but the font it uses is often too small and unreadable. To ensure sufficient readability, we had to pay special attention to the font size. Due to the size of the screen, only a limited amount of the content can be shown at one time. Too much text on a page causes the content to be difficult to comprehend, causing the user to quickly lose the joy of using the application.

Figure 3. The Privacy Quiz running on a Blackberry Bold 9700 and Torch 9800

Besides these hardware limitations, an overall user-centred design had to be reflected in all the designs. Thanks to the pre-existing corporate design, we were able to draw upon a styleguide from Lufthansa. The use of the existing appearance of Lufthansa not only creates a simplified usability, but also a good recognition of the brand with all its interpretations: reliability, security, and freedom.

During the entire design process, we followed the iOS design principles [3], which claim "when an app fits well on the device screen and responds to the gestures that people know, it provides much of the experience people are looking for. And although people might not be aware of human interface design principles, […], they can tell when apps follow them and when they don't."

IV. THE QUIZ LOUNGE APP

Our game starts with a Welcome screen (Fig.4) that contains a "Nice-to-know fact" from the field of data security. This fact is shown in order to inform and potentially surprise the user with information they may not know about data security and as a result help the user to create awareness for the topic. It also serves to pique the user's curiosity.

Translation of Fig.4:

Did you know?

…that more than 35.000 Blackberrys are left behind in England's taxis every year?

This corresponds to approximately 40.000.000 e-mails which could contain confidential data about you or your company.

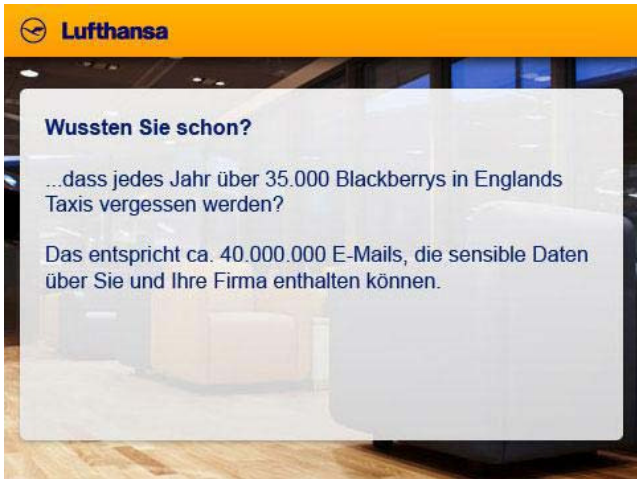

Figure 4. Welcome screen

After reading the "Nice-to-know fact" on the Welcome screen, the user is shown the main menu (Fig.5), where he can either start a new game, continue a game, look-up a word in a glossary or exit.

Figure 5. Main menu

When choosing to start a game and selecting a topic and a subcategory inside that topic, a quiz starts (Fig.6). Each quiz consists of 10 questions in three different difficulty levels. Green marking relatively easy questions, yellow marking an intermediate level, and red marking challenging questions.

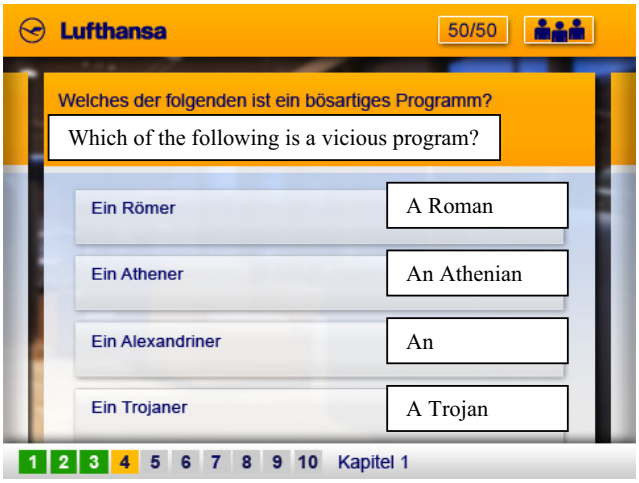

Figure 6. Typical quiz question with 4 possible answers

If a question is answered correctly, the user gets a detailed explanation for his answer (Fig.7).

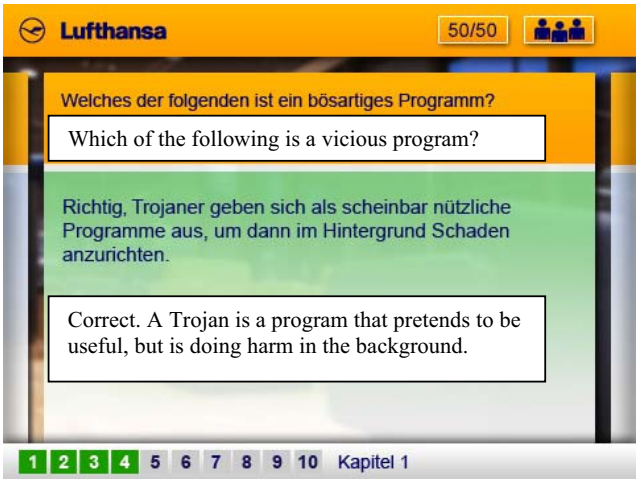

Figure 7. Feedback to a correct answer

In case an incorrect answer was chosen, a detailed explanation is given as well – this time on a red background, marking the incorrect choice (Fig.8).

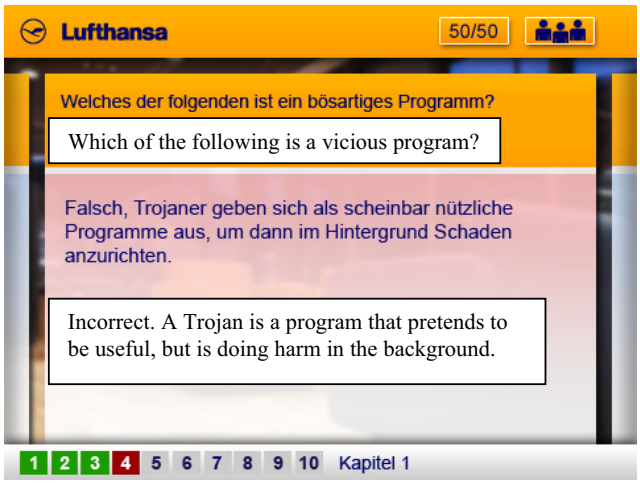

Figure 8. Feedback to an incorrect answer

V. Architecture and Technology of the App

What appears to be convenient for humans to read is usually not readable for computer programs, in this case our Blackberry App, so the content has to be prepared in such a manner that the program is able to read the text and create data objects which can be used as app-internal data representations. In order to meet this requirement, an appropriate format had to be chosen, which can envelope content making it readable and understandable for the app.

Extensible Mark-up Language (XML) is a standard technology that provides the ability to structure a text document to make it readable by humans as well as by computer programs. XML is defined in the XML 1.0 specification produced by the World Wide Web Consortium (W3C). [4]

Because XML is considered standard, a huge number of proprietary and open source programs support it, and hence are able to interpret it easily. Moreover, many programming languages provide APIs for processing XML-documents, including Blackberry JRE. Based on Java - the most supported programming language for developing Blackberry Apps - Blackberry JRE provides API's for handling XML-documents.

Another advantage of using XML is its support of XML Schema Definition (XSD). XSD is recommended by the W3C for defining and structuring XML-documents [5]. XSD enables the formal definition of XML-documents by defining the type and amount of data contained in it. By means of XSD, the structure of an XML-document can be restricted and also validated against the XSD document that describes the document's structure. The ability to validate XML documents was of considerable importance for the project, as the App can check the content for correctness and react appropriately.

The content is transmitted in XML-format from the server to the smartphone and is then parsed into Java objects which are locally stored in the database of the smartphone (Fig.9).

Figure 9. XML connection layer

VI. Authoring Tool

In general, downloadable apps do not come with the option for the user to modify the app. They are rigid in the sense that the user has to wait for a new version if he wants a different functionality or updated content. In our case, we wanted to give this flexibility to Lufthansa.

In order for Lufthansa to be able to modify the content of the data privacy app and also in order for them to be able to create new mobile quiz apps, we designed and uniquely developed a web-based authoring tool which enables users to modify the content of the app using an easy-to-use, self-explanatory interface which enables the author to create new quizzes and new questions for existing quizzes, as well as change existing content (Fig.10).

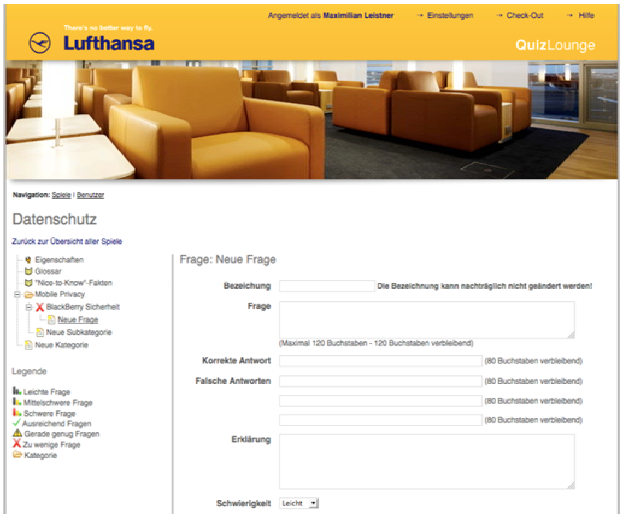

Figure 10. The GUI of the authoring tool

VII. Architecture and Technology of the Authoring Tool

QUIZ LOUNGE's authoring tool is designed and implemented in PHP as a web application, thus demanding minimal computer affinity of the author. Several authors can work in parallel on either the same quiz or different quizzes.

After modifications have been made via the authoring tool, the tool converts these modifications into XML files, which are then transmitted via the server to the smartphone, where the Eclipse-based Blackberry App locally stores them as Java objects in an SQLite database (Fig.11). An update mechanism reacts dynamically to changes in the content by communicating with an Apache-Server. That way, the content on the smartphone is always held current.

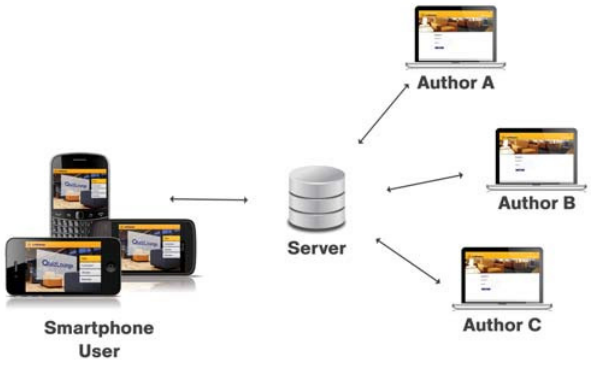

Figure 11. Communication between the author(s) and the app

VIII. Diversity of Mobile Devices & Portability Issues

In order not to be limited to Blackberry devices, and because the smartphone market is very diverse (Fig.12), we explored the question of porting the app to other mobile devices.

Figure 12. Diversity of the mobile device market

After exploring the smartphone market and looking at current sales figures, five main platforms and their different operating systems could currently be identified: Research in Motion (RIM) with their Blackberrys, Apple's iOS and their iPhones, Android devices, Microsoft's Windows Phone and Symbian. For answering the question of portability, we disregarded Symbian phones, as this operating system is undergoing a clear decline in market share [6].

In general there are two alternatives to successfully run the app on other devices:

Either you natively re-code the app for the other operating systems (Fig.12) or you use Cross-Platform Development (CPD) Tools (Fig.13) to convert the apps directly.

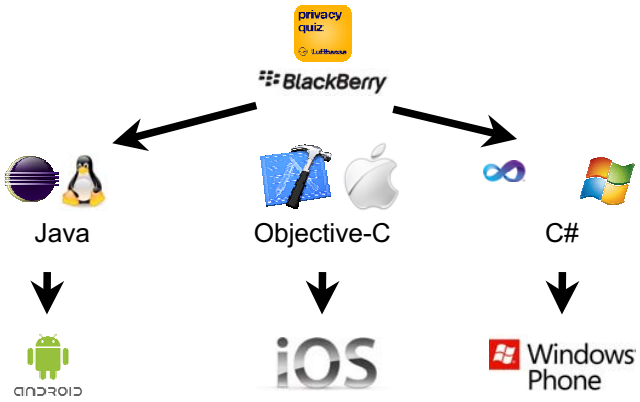

Figure 13. Native Programming of an app for different operating systems and platforms

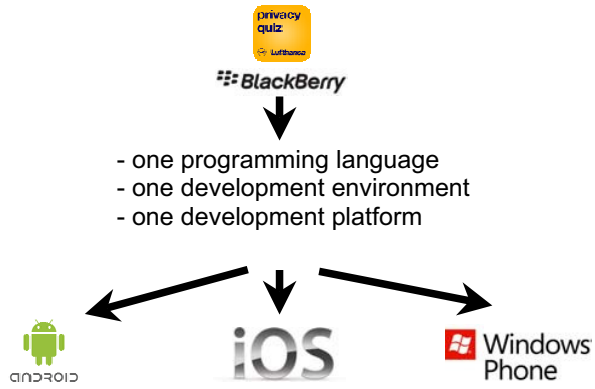

Figure 13. Using CPD tools to convert an app for different operating systems and platforms

After implementing and comparing the alternatives, we didn't come to a clear conclusion as to which of the alternatives is to be preferred. The native approach involves the detailed understanding of different operating systems as well as different programming languages for those operating systems, but leads to a direct transfer of all functionalities of the app, including its navigation on the GUI. The CPD approach, which initially appeared to be faster, resulted in a fast transfer of most of the functionalities, but demanded thorough programming in detail, e.g. when certain details didn't get translated and had to be manually debugged and re-coded. Both approaches led to successful results. End users were not able to distinguish between a natively developed app vs. a CPD-generated app.

The QUIZ LOUNGE is now successfully running on four different platforms.

IX. SUMMARY

The Quiz Lounge project is a collaboration between Hochschule Darmstadt and Lufthansa AG. The goal of the project was the development of a mobile e-Learning application by the use of which Lufthansa's managers should be able to learn about data privacy topics playfully and interactively.
The application is based on a quiz concept and asks the user for answers to a series of ten questions which increase in difficulty level. While playing the game the user can use two "lifeline" helpers, the audience- and the 50-50-helper. Furthermore, the user has the ability to browse a glossary of related terms if he or she has the need of more detailed knowledge. New questions and also new games can be added with a web-based Authoring Tool. The Authoring Tool was uniquely developed for the Quiz Lounge application and conforms to the specific needs of its architecture.

Although the app was initially developed for Blackberry devices, we have ported it to other mobile platforms in order to not be limited to just one environment.

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[4] XML definition: http://en.wikipedia.org/wiki/XML; last visit: Feb.13, 2012.

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Reducing the complexity of understanding cryptology using CrypTool

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ABSTRACT

Cryptography and cryptanalysis are characterized by a great number of algorithms, parameters, and protocols where at least some of them can be considered as complex mathematical structures. As cryptography is a crucial part for securing many modern applications, it is important on the one hand that developers understand what are efficient and correct ways to implement those security mechanisms. On the other hand, users of such mechanisms need to get a better understanding why and how to apply them properly. In this paper electronic learning such as self-regulated learning, computer-based trainings, and learning by doing are presented with the help of a modern e-learning program – CrypTool (CT) – which supports both afore described approaches for developers and users. For users who are interested in cryptography, CT provides an easy way to experiment with cryptographic algorithms and protocols by augmenting complex algorithms with visualizations and context-related explanations. This paper gives an overview how to implement and apply cryptographic concepts and how to teach them. Additionally, this paper fortifies these claims with an evaluation using the feedback from classes where CT was used to teach cryptographic algorithms.

Keywords: E-learning, CrypTool, cryptography, cryptanalysis, visualization, visual programming.

1. INTRODUCTION

A sustainable approach to understand something which might look at first glance quite complex is to teach it yourself because then you have to research all relevant information from different sources and work through it step by step to get the desired knowledge. This approach will be connected with different questions which have to be solved and answered. A didactic method to achieve this objective is the concept of e-learning by using modern technologies. In this paper we give an overview of some principles of e-learning and show in a case study how these principles have been taken into account when the free e-learning tool CrypTool has been designed and implemented.

E-Learning can be used in contrast to traditional teaching concepts to study a specific topic. A brief overview of e-learning approaches is presented in Section 2. In this paper e-learning is considered against the background of cryptography and cryptanalysis. Even though cryptographic mechanisms can be found in many modern applications, a lot of users consider the mathematic principles to be complex. At the same time, there is a great demand for cryptographic mechanisms because electronic applications should often process or transfer data in a secure and trustful way. E.g. a person might want to book a vacation in the Internet, would like to buy a book online, or wants to do online banking or store passwords on a smart phone. In all these cases, security is a base requirement which is established based on cryptographic mechanisms. In Section 3 we provide an overview of the free and open-source software CrypTool which invites different target groups to learn more about cryptology. This can either be achieved by using the application CrypTool to visualize and explain cryptographic mechanisms or adding new features and protocols to the software by implementing those as outlined in Section 4. Afterwards, we describe in Section 5 how this has been realized in the second version of the software "CrypTool 2". By using the application within the scope of schools and universities, first experiences with this concept have been made and are shown in Section 6. Finally, a conclusion is drawn in Section 7.

2. APPROACHES FOR E-LEARNING

Different didactic methods have been described in the literature to impart knowledge. In schools knowledge is often provided to students by face-to-face lectures that present a specific topic, allow for questions, and mostly use exercises to demonstrate the topic in more detail. With the introduction of new media such as computers and smart devices additional ways have been presented to teach or educate a complex topic.

One approach described in [1] and [2] is called self-*regulated learning* and encourages a person to understand something in a practical way with the help of digital media. In [1] self-regulated learning is described by three components: At the beginning of the learning process a person is guided through the process but is encouraged over time to inherit more and more responsibility and flexibility what and how information is received. Secondly, it is outlined that working as a team can be used to collaborate and bring together different perspectives. Thirdly, learning results and ideas can be shared.

Many companies use the concept of *Computer Based Training* (CBT) or *Web-Based Trainings* (WBT) to provide different kinds of information to their employees in a modern and interactive way e.g. by using sounds, figures, and/or interactive quizzes (compare [3] and [4]). Thereby, different kinds of technologies allow the user to get more and more involved in the e-learning process. While CBTs are considered as offline applications WBTs allow connecting more information and people with each other online.

E-Leaning can also include game-based approaches (compare e.g. [5]). In [4] this is repatriated to the concept of "trial and error" which challenges the user and allows improving knowledge and behavior over time.

As mentioned before multimedia is an important part of e-learning. It is stated in [6] that interactivity and *visualization* can help to understand mathematical concepts easier because "spatial rationalness and virtual imagination are trained".

3. THE OPEN-SOURCE PROJECT CRYPTOOL

CrypTool is a free e-learning software for cryptography and cryptanalysis which can be downloaded from the CrypTool portal at www.cryptool.org. Originally, it was developed for an awareness and IT security initiative within Deutsche Bank [7]. In the course of time, it became an open-source project with more than 60 volunteers offering more than 200 cryptographic functions [8] within an e-learning environment and which is today used by many users all over the world: pupils, students and others interested in cryptography.

The first version, called CrypTool 1 (CT1) was implemented as a Windows application following the concept of CBT in the programming language C++ and is available in five languages: English, German, Spanish, Polish, and Serbian. The next release 1.4.31 of CrypTool is planned for Q3/2012 – localizations also for Greek and Russian are in progress [9]. Today, CT1 is mainly enhanced only by smaller changes like bug fixes and afore mentioned new localizations due to the fact that two successors – which can be understood as the next generation of this application - have been released: CrypTool 2 (CT2) and JCrypTool (JCT).

CT2 is also implemented as a Windows application but based on the concept of visual programming. The application uses a plug'n'play interface which allows a user to connect different kinds of components to build individual workflows via drag&drop. Such workflows can also contain loops and conditions, allowing the user to create complex programs. This enables the user to specify cryptographic functions or a complex combination of cryptographic primitives from a visual perspective. CT2 is written in C# using Visual Studio 2010. While CT2 is currently available in English, the implementation of a German version has already been started. Developers can easily add new functionality via the .NET Framework and a plug-in infrastructure. The second successor is JCT. This variant has been implemented in Java by using Eclipse. Thus, it executes on different platforms such as Windows, MAC OS, and Linux. Like CT2, JCT also supports the concept of plug-ins so that new cryptographic algorithms and protocols can easily be added. JCT consists of two main parts: "JCrypTool Core" which is supported by a small team to provide the base functionality and "JCrypTool Crypto" which is open to all interested developers to implement crypto plug-ins.

Besides the afore described three versions which are full-blown programs to be installed on your computer, the browser-based CrypTool-Online (CTO) supporting the concept of a WBT has been made available on www.cryptool-online.org. This allows CrypTool to run on a smart phone which could be used at any location in daily life or leisure (e.g. to solve geocaching riddles).

CrypTool helps to establish awareness and a better understanding for IT security not only in universities, but also within companies and public authorities. Thus, awareness trainings have been conducted with the application CrypTool e.g. in Deutsche Bank, Boeing, Microsoft, the Federal Office for Information Security, and the Federal Criminal Police Office in Germany.

4. E-LEARNING – THE CONCEPT OF TEACHING YOURSELF CRYPTOGRAPHY WITH CRYPTOOL

The Application Perspective

Using an application that requires security mechanisms does not automatically mean that every person has to implement this mechanism by her- or himself. Nevertheless, it can be advantageous and is recommended to understand the principle behind this mechanism better because this can e.g. help against attacks within the scope of social engineering.

For example, if you have subscribed to a service like online banking, where you have to present a login name and a PIN or password, you should be aware what exact information is required by you in order to successfully log in to this service and afterwards use it as desired. Otherwise, you could become a victim of a phishing attack, where someone tries to direct you to a fraudulent homepage to receive some valid TANs that allows – together with some eavesdropped information – to do unauthorized transactions with your account. As another example, a user in the Internet has often to specify a password to register for an online service. In many cases, there is the requirement to choose a password consisting of upper and lower case letters and it should consist at least of 8 digits. However, for the user this yields to the question how to find a password to use the respective service in a secure and trustful way. Figure 1 shows an example for a Password Quality Meter in CT1

providing the user instantly information on the estimated security of a password entered.

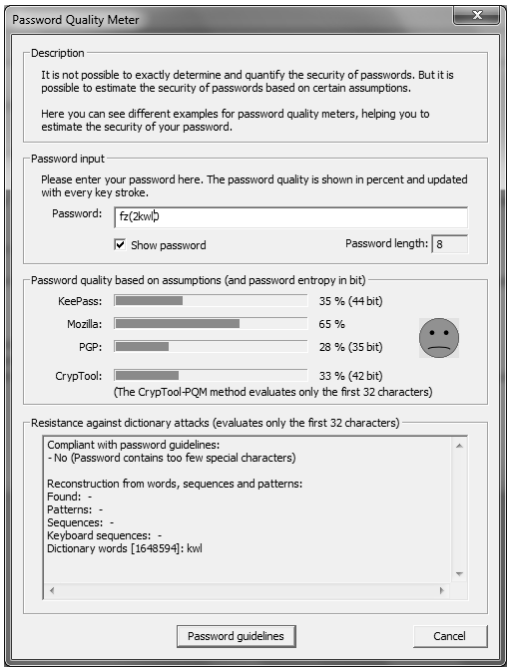

Figure 1: CrypTool 1 - Password Quality Meter

An e-learning tool like CrypTool provides the opportunity to guide the user step by step through a specific security mechanism by supporting the concept of self-regulated learning. Thereby, the user is enabled to change single properties that might lead to different results. An online help can be opened to provide additional information to the requested topic. However, the user cannot only learn how a security mechanism works based on the configured parameters. The cryptanalysis part also illustrates how and why the mechanism could be attacked. This allows for a comprehensive view for security protocols. The strength of a cryptographic algorithm is, in many cases, related to a time measurement indicating how long the algorithm can be used based on current calculation mechanisms of current computers.

Visualization as described in [6] is a good way to provide insight into a security mechanism. Often, a cryptographic protocol might require two communication partners to exchange information even if they have never met before. After they have both performed some calculations on their own sides, communication partner A (Alice) sends one of her results over to the other communication partner B (Bob), who then does additional calculations and sends the result of his calculations back to A. This is done e.g. by the Diffie-Hellman key exchange protocol [10]. Even though this might sound very theoretical, this is a mechanism that is included in a lot of applications. E.g. it can happen when you log on to an Internet page by using Transport Layer Security [11]. As another example, the Diffie-Hellman key exchange protocol is applied when a European ePassport is electronically checked within the scope of Chip Authentication [12] at the border in the moment the ePassport is read by an electronic inspection system. As described before, the protocol requires the exchange of information between two different communication partners (here: inspection system and ePassport). As a result, protocols are a very good candidate for an animation or visualization because the user can be guided step by step through the protocol viewing both perspectives (compare Figure 2).

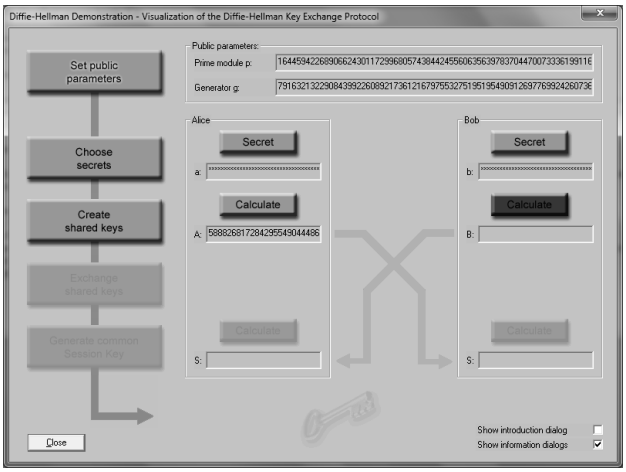

Figure 2: CrypTool 1 - Diffie-Hellman Demonstration

In the open-source project CrypTool, users of the application can easily give feedback or act as testers of the software. If an additional feature or information could be helpful or an error is recognized, the CrypTool portal offers several possibilities, e.g. with a ticket system to request a change in the software.

The Implementation Perspective

Although the application perspective already provides detailed information on a cryptographic mechanism, even more insight can be obtained when implementing the mechanism by yourself. For example, this could be interesting for a system administrator who needs to enhance a service with IT security mechanisms or a developer who implements software and wants to add encryption, integrity or authentication services.

The successors CT2 and JCT include a plug-in interface which means that if someone wants to add a new feature, one does not have to implement everything from scratch. Additionally, modern programming languages already provide security mechanisms through a defined architecture. E.g. in Java the Java Cryptographic Architecture (JCA), which includes the Java Cryptographic Extension JCE), allows the use of cryptography based on provider(s) that can be integrated through the JCE (compare [13]). Therefore, a developer does not need to implement everything from scratch, but can leverage functionalities from specific libraries and can focus on the parts that are not already included in those libraries. A presentation with detailed information on how to build such a plug-in for JCT can be found in [14]. Although programming languages already offer a baseline for cryptographic functionality, the

CrypTool project does not limit the user to just one way in implementing an algorithm. On the contrary, there is a great flexibility when it comes to the freedom on how an idea for a cryptographic mechanism can be realized. As described before, one example for this flexibility is visualization and this has actually been carried out in all three versions of CrypTool by allowing the user to test mechanisms with different options and/or parameters.

5. SELF-REGULATED LEARNING – AN EXAMPLE WITH CRYPTOOL 2

The Application Perspective

Visual programming is a key element in CT2 offering the user a flexible way to reassemble all components of a cryptographic workflow. On the application side, a user has different options to start off by using:

- the wizard,
- predefined templates, or
- the workspace manager.

The wizard allows a user to choose from the features in the tool and to combine them by choosing step by step from different options, with explanations provided in each step. At the end of the wizard process, the result is shown as a workflow in a new project. The second possibility to start with is to choose from the predefined templates. If the user selects one of the templates, a complete workflow for that mechanism is opened up as a specific project. A workflow consists of different components that are in some way connected to each other.

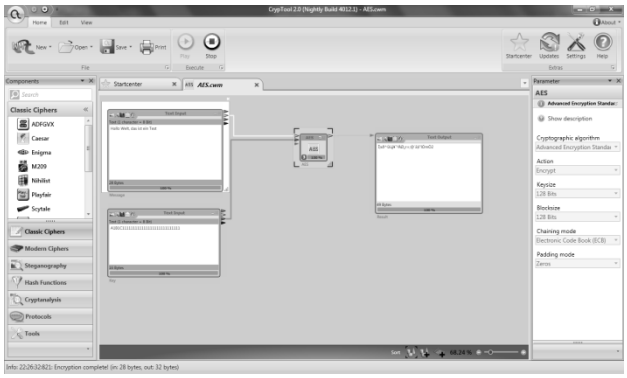

Figure 3: CrypTool 2 – Simple Workspace with AES Cipher

For example, Figure 3 displays a workflow showing an encryption method including a "Text Input" component with the plain text message that should be encrypted, a component visualizing the encryption method (here AES), and a "Text Output" component which contains the encrypted text as a result after the workflow has been executed. More complex workflows based on loops and conditions can be created. As an example, we provide a template which loops through all possible Caesar decryptions and stops when enough words from the decryption are found in a given dictionary. With this, the general concept of brute-forcing an algorithm is visually demonstrated. A more experienced user can start with the menu item workspace manager, which then opens up an empty project where the user can choose individual components from the left hand side in order to design own processes.

Independently of how the user starts, a workflow will be displayed: It could be as easy as the AES cipher in Figure 3 or more complex like the PRESENT cipher [15] in Figure 4, which shows, that even within a component of the workflow, visualizations can be displayed.

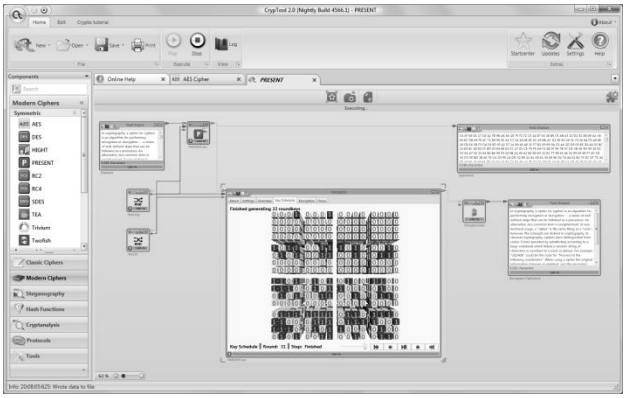

Figure 4: CrypTool 2 – Workspace with PRESENT Cipher

A component can have one or more interfaces each specified by a set of arguments and their data types either as input (left side of the component) or output (right side of the component). This allows data in different formats to flow from one component to another. The user can choose components from the component editor on the left side and connect an output interface with an input interface if matching data types exist. If a component is selected in the main project window, the user can switch between different views: visualization, parameters, log, data and help. Each view provides different information about the component (if implemented by the developer): The visualization view can show an arbitrary animation for the specific algorithm. Parameters, e.g the key used, can be set in the parameters view (additionally, parameters can also be set by the user on the right hand side when a component is selected (see Figure 3) – this is especially useful, when watching a live visualization of a component and the user wants to see immediate effects while changing some parameters. Furthermore, data in the components, e.g. text in a "Text input" component, that should be encrypted, can be adapted interactively at any time, and the effect can be seen instantly. In order to execute a project (let data flow through the complete workflow), the user has to select the button *Play* which can be found in the *Home* ribbon. As in other versions, CT2 provides the opportunity to visualize not only cryptography, but also cryptanalysis.

The Implementation Perspective

In order to help a user starting to implement an own plug-in for

CT2, an exhaustive "Plugin Developer Manual" [16] can be found on the CrypTool portal. It includes not only information on how to develop a plug-in for CT2, but also provides information on how to get started, i.e. how to check out the sources from the Subversion repository and compile the code within Visual Studio 2010 or Visual C# 2010 Express (read access to the repository is provided for anyone). This is in particular helpful because a developer needs to understand how to work with the developing environment before starting with the plug-in itself. To receive write access to the repository, the user can contact the CrypTool team over the CrypTool portal.

Besides the implementation of a plug-in, the user needs to research the information for the cryptographic feature. This is usually done in accordance with standards or published research papers. Afterwards, the developer decides how the feature should be visualized. This is not only important for the implementation, but also for writing the integrated online help.

Finally, when the user has implemented the plug-in, including the respective documentation, additional testing must be carried to ensure quality assurance. Usually, testing is not only performed by the developer, but can also be achieved by other users, as the plug-in could be integrated in an interim version called '*nightly build*'. The CrypTool portal offers both stable CT2 versions (beta and release versions) as well as nightly builds, which are automatically compiled over night based on what has recently been checked in into the Subversion repository. So the software development process of CT2 follows an idea of agile and extreme programming – always have running code [17].

6. EXPERIENCES WITH TEACHING CRYPTOGRAPHY

Cryptography is one area in schools and universities that offers students an exciting and motivating way to work on complex mathematical questions. One example for an event to teach cryptography to high school students and school children is described in [18]. In Germany, the event "Schuelerkrypto" (English: student crypto) has been organized since 2009. During this event, an overview of the principles of cryptography as well as cryptanalysis is provided. Presentations are followed by small exercise classes on the computer where CT1 and CT2 have been installed in advance. The exercises are designed as a special agent story i.e. a game-based approach to find the thieves of some famous old paintings. The following statistics have been compiled based on course feedback from students who took part in the event in 2011 (24 participants) and twice in 2012 (29 participants and 22 participants). The participants of the pupil crypto event were between 14 and 19 years.

For a better understanding how CrypTool has helped to change the knowledge in cryptography the students were asked how much experience they had in this topic before the event. In 2011 70% of the pupils expressed that they did not have any experience with cryptography before. 100% of the pupils stated that the event helped them to improve their knowledge in cryptography. Also in 2012 the pupils participating in the event were asked about their knowledge regarding cryptography before the event. This time 79% (59%) responded that they did not have any experiences with this topic. 90% (86%) stated that the event helped them to improve their understanding of cryptography while 10% (14%) responded that the event helped them partly to improve their knowledge.

In order to get a better understanding on how the usability of CT1 and CT2 was perceived the pupils were also asked to rate the two applications. In 2011 CT1 was rated by 29% with very good and 63% with good usability by the students. At the same time CT2 was rated 50% very good and 29% good usability. The students from the Schuelerkrypto 2012 event rated CT1 with 10% (36%) very good and 59% (45%) good. The usability of CT2 was rated 24% (45%) very good and 76% (36%) good. The results are also shown in Figure 5.

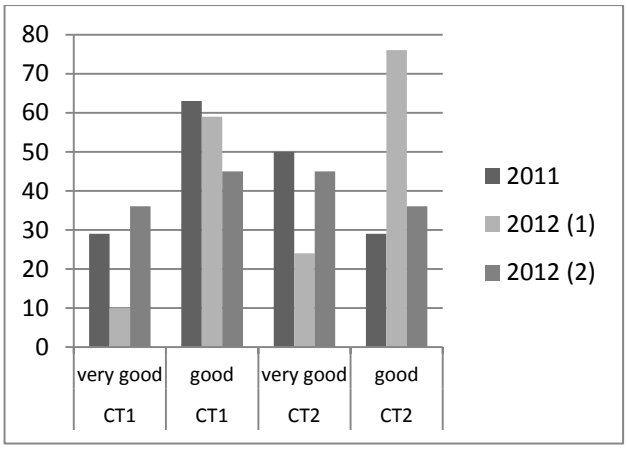

Figure 5: Usability of the CT Software Version 1 and 2

Being asked if CrypTool as an e-learning tool has helped to provide a better understanding on cryptography and crypt analysis in 2011 83% of the students agreed to this statement and 17% partly agreed. As a comparison in 2012 90% (86%) of the students agreed to CrypTool being helpful as an e-learning tool while 7% (14%) stated that the application is partly helpful.

As most of the students had no or less experience and pre-knowledge with cryptography they rated the learning-curve and the usage of the e-learning tools CT1 and CT2 very positively.

7. CONCLUSIONS

The open-source software CrypTool supports, in three different versions, an interesting and exciting way for e-learning within the scope of cryptography and cryptanalysis by considering concepts in particular such as self-regulated learning, CBTs and WBTs, and visualization. CrypTool is not only focused on developers that want to implement a security mechanism by themselves but also addresses a user that just wants to understand the concept on an application layer. Not only small

number examples to reduce the mathematical complexity, but in particular the concept of visualization and collaboration of different people adding more information and functionality to CrypTool are key components to achieve this objective.

Flexibility is very important to allow the user or developer to try different approaches how something should be realized. Of course, flexibility should always be balanced with a good architecture approach of such an e-learning software. Nevertheless, the concept for flexibility is not yet finalized. In CT2, it is planned for a future release to allow a developer to insert code over the application view during runtime. Thus, typed-in C# code could be executed directly. Another planned feature is to easily support building up ad-hoc peer-to-peer networks of multiple CT2 instances by different users.

This paper has shown different concepts used to educate people on cryptography and cryptanalysis with CrypTool in order to raise security awareness. But following the concept of collaboration – CrypTool is not limited that users can only learn with the application or enhance the software by adding new functionalities. The concept of this e-learning software is completed by an international Crypto Cipher Contest called MysteryTwister C3 (MTC3) [19] which allows to test the self-trained skills directly on ciphers which have been defined with different severity levels. Again a participant is invited to just solve the riddles that have been posted or to share the new knowledge that has been gained by using CrypTool by adding a new self-made riddle to the contest.

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Cognitive Styles, Computer Attitude and Internet Use

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ABSTRACT

One of the challenges facing instructional designers is in producing e-learning systems, which take account of individual differences such as nationality, gender and more importantly from an educational perspective, cognitive learning style (Graff, et al, 2003) University students completed a computer attitude scale (Smalley, et al, 2001), a questionnaire based on CSI (Allinson & Hayes, 1996) and knowledge of internet use. Results are discussed in terms of the implications of the research on e-learning systems.

INTRODUCTION

Much research has been done showing the benefits of e-learning inside and outside of the classroom. In spite of the bulk of research conducted both on theory and practice, however, little is known about learner characteristics. When e-learning systems are not designed in consideration to learner characteristics and their differences, difficulties are bound to occur (Graff, Davies & McNorton, 2004). Differences between learners may be designed in terms of nationality, gender and cognitive learning style (Freedman and Liu, 1996; Liang and McQueen, 1999)

Cognitive Learning and Culture

Graff, et al (2004) admits that culture may be a key factor in the learner differences. The study indicates that it is also theoretically possible that individual differences may occur cross-culturally because of differences in cognitive learning style between individuals from different cultures. The topic on cross-cultural differences in learning style has been debated over the past decades. While some authors hinted that cognitive style and culture may not be related, others assert that there are cross-national differences in cognitive style. Allinson & Hayes (2000) found that managers from European and Latin cultures were more intuitive than their counterparts in developing countries and Arab countries. Furthermore, some research evidence shows that students in high school and university levels in East Asian countries exhibit more effective learning styles and academic performance than their western counterparts (Biggs, 1991; Kember and Gow, 1991). Graff (2004) indicates that one possible explanation for this difference can be accounted by differences in the approaches is studying between culture groups. Smith (2000) reported

such differences between Australian and Chinese university students. Turner (2000) also reported that learning approaches of students from the People's Republic of China studying at degree level in the UK approach learning with a culturally different learning style from British educated students.

Cognitive Learning and Gender

Riding (2000) conducted an investigation differentiating students according to analytic or wholist cognitive style criterion. The criterion is similar to the analysts-intuitive cognitive style difference. Riding reports that differences between learners tend to be small and non-significant. The findings however suggest that males tend to be more slightly more analytic than females.

Cognitive learning and attitude towards computer learning

One way of assessing and individual's approach to computer use for instruction is by testing an individual's attitude to this. (Graff. 2004) Several studies have explored individual differences in attitudes towards computers in the last few decades. For example, differences have been noted between attitudes to computer assisted learning and personality factors (Francis, Katz and Evans, 1996), self-image and locus of control (Woodrow, 1990; Katz, 1994) and risk taking (Offirt and Katz, 1990). Interestingly Abouserie, Moss & Barasi (1992) hinted that male students preferred using computers in their learning than females.

Accordingly, further exploration of individual differences in attitudes towards computers for instruction may reveal different approaches to computer use between the different types of learners. (Graff, 2004) Graff insists that it would appear to be useful if a study into individual differences in computer use for instruction will explore three major factors such as nationality, gender and cognitive learning style.

This research aims to replicate the findings of Graff, et al (2004) that suggests e-learning instructional design must take into account individual differences such as nationality, gender and cognitive learning style. One hundred university students completed the Cognitive Style Index (Allinson and Hayes, 1996), a computer attitude scale (Smalley, Graff and Saunders, 2001) and a questionnaire on their knowledge of internet use.

METHOD

Participants

Samples of 100 undergraduate Japanese students were used as subjects for this study, with age ranging from18 to 20 (mean age= 19.30). There were 56 males

and 43 females, with 1 not recorded. Instruments used for the study are the Computer attitude scale (2001), Cognitive styles index (1996) and a questionnaire.

Instruments

1. **Computer attitude scale (Smalley, Graff, Saunders, 1996)**

   Attitude towards computer use was assessed using the Jones and Clarke (1994) computer attitude scale for university students. The instrument consists of three subscales assessing he affective, behavioral and cognitive components of the respondents' attitude. The scale was later revised and updated using Smalley, Graff and Saunders (2001) using a sample of 100 samples. The results yielded Cronbach alphas for each attitude subscale of 0.76 (affective), 0.65 (behavioral), 0.71 (cognitive and 0.81 (total). Test-retest reliability of the revised scales is found to be satisfactory (r= 0.73, p<0.001>.

2. **Cognitive Styles Index (Allinson and Hayes, 2001)**

   The Cognitive Styles Index (CSI) (Allinson and Hayes, 1996) is a self-report designed to measure the whole/part-processing dimension of cognitive style. The instrument contains 38 statements, to each of which a respondent must indicate a true/uncertain/false response. The test identifies an individual's cognitive style as being either analyst or intuitive. The term intuitive is used to describe an individual who makes judgments based on feelings and who adopts a global approach to processing information, whereas the term analytic describes an individual who makes judgments based on reason, and who focuses on specific detail when processing information. With a theoretical maximum score of 76, higher scores indicate a more intuitive cognitive style and lower scores indicate a more analytic style. (Graff, Davies, Mc Norton, 2004) A self-made CIS was made patterned after the psychometric properties of the instrument reported in Allinson and Hayes (1996).

3. **Questionnaire**

   The questionnaire for this study consisted of 18 questions. The first part of the questionnaire measured knowledge of internet use. The scores ranged from 8 to 16. The second part of the questionnaire asked for information such as how easily respondents reported they were able to find information using the internet and whether they became lost, distracted or frustrated when doing so. A high score indicated high ease of use whereas a low score indicated low ease of use. The scores ranged from 8

to 40. In this study the ease of use scale ranged from 15 to 30, with a mean score of 20.11 The final part of the questionnaire asked participants to estimate the number of hours per week they used the internet.

PROCEDURE

The general design of this study, modeled after Graff, Davies and Mc Norton (2004), involved a comparison of computer attitude, internet knowledge and ease of use between students with different cognitive styles. Data collection simply involved completion of test instruments and questionnaires by students during a class.

RESULTS

1. Differences in computer attitude scores, internet knowledge and ease of use for cognitive style and gender

   For the purpose of data analysis, participants scoring in the lowest 25% and highest 25% on the CSI were labeled as 'analyst' and 'intuitive', respectively. Table 1 shows the means and standard deviations for cognitive style and gender on computer attitude scores. Table 2 shows the means and standard deviations for cognitive style and gender for scores in Internet knowledge, ease and number of hours of use.

Table 1 Computer Attitude Scores for Cognitive style and gender

Cognitive style	Gender	Overall	Affective	Behavioral	Cognitive
Analyst	Male	70.12 (17.06)	21.19 (3.14)	23.40 (8.79	22.45 (3.85)
	Female	73.15 (15.18)	24.38 (5.16)	22.21 (6.77	23.48 (4.36)
Intuitive	Male	84.70 (22.41)	25.56 (5.87	27.65 (7.17)	28.23 (7.22
	Female	80.33 (15.57	26.78 (8.10	24.31 (4.56)	25.40 (6.47)
All	Male	77.41 (19.74	23.38 (4.50)	53.05 (7.98)	25.24 (5.54)
	Female	76.44(15 .38)	25.58 (6.63)	23.26 (5.68)	24.44 (5.41)

Table 2 Internet Knowledge, Ease of Use and Hours for Cognitive Style and Gender

Cognitive style	Gender	Knowledge	Ease of Use	Hours of Use
Analyst	Male	4.44 (4.68)	21.10 (2.31)	5.46 (4.21)
	Female	5.61 (3.56)	20.61 (4.11)	6.54 (5.98)
Intuitive	Male	5.65 (5.10)	19.23 (3.00)	8.21 (7.88)
	Female	5.12 (4.88)	20.35 (3.29)	7.80 (5.68)
All	Male	5.05 (4.89)	20.17 (2.65)	6.84 (6.06)
	Female	5.37 (4.22)	20.48 (3.70)	7.17 (5.83)

A two way ANOVA was calculated to examine the effects of cognitive style and gender

On computer attitude scores (CAS) and scores on internet knowledge, ease and hours of use.

A significant main effect of cognitive style was noted for Internet use ($F_{1,76}=4.51$, $p<0.05$). An analysis of the means reveals that students with an intuitive cognitive style had greater self-reported Internet use than those with analytic cognitive style. The mean hours of use was noted at 8.00 Hrsp.w and 5.50 Hrs.p.w, respectively.

There was also a significant mean effect of cognitive style on computer attitude scores ($F_{1,78} = 4.54$, $p<0.05$). The effect was such that the intuitives had a higher CAS mean scores than the analysts, 82.52 compared to 76.40. Therefore students with analytic cognitive style demonstrated more positive attitudes towards computers. There was also a significant effect on the affective and cognitive CAS scores ($F_{1,78} =6.87$ and 5.64, respectively, $p<0.05$). No significant effects were noted on the interaction between gender and computer attitude or between gender and cognitive style.

Discussion

The aim of the study was to investigate individual differences in approaches to using computers among university students displaying different cognitive learning styles.

The findings of this study illustrate that analysts report a more favorable attitude to computer-based learning than intuitives. Furthermore, when the attitude scale is analyzed in terms of its subsections, significant effects were observed for the affective and cognitive subscales, with analysts reporting more positive affective and cognitive attitudes towards computer-based learning than students with intuitive learning style.

However, analysis of the time spent on computer reveals that students with intuitive learning style report greater

internet use than analysts. Typically those with intuitive learning style are more socially orientated than analysts and therefore the results are intriguing. It seems to indicate that intuitives spend more time engaged in isolating computer activity. (Graff, Davies, McNorton, 2004) Further studies would require an analysis of which particular computer-based activities analysts and intuitives engage, for instance, more isolating web-based searching and browsing for information or activities such as internet based interaction with others.

CONCLUSION

The above findings suggest that individual differences are evident in terms of attitudes to computer-based learning and Internet use and that these differences exist principally on the cognitive learning style. The results suggest that future design of web-based and computer-assisted learning systems need to take account of this difference. Furthermore, future study needs to analyze the relation between nationality of students in this study and the differences in cognitive styles, in order to confirm previous findings that cross-cultural differences in internet use and computer attitudes exists.

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Developing a cognitive system: An integrated approach of object, algebra and geometry

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ABSTRACT

The progress on mathematic education of primary school in China so far has been limited to the comparison between English education and Chinese education. The major reason for the limited success in this area is believed to be the lack of a successful cognitive tool/software that supports students studying and exploring and at the same time covers the whole curriculum of primary school mathematics. This paper summarized the current status of computer application in mathematics education in primary schools in both China and other countries. More than twenty pieces of computer software with exploring and cognitive functions were analyzed. We concluded that although computer-aid learning technologies are relatively mature, the software itself does not cover the full contents and examination capabilities that are required by the primary school education system. With respect to the realization of the supporting software platform of math education, this paper laid out the principles of building such platform. Both the oriented model framework and functional model framework were built, with the key realization techniques discussed. This platform was applied to classroom experiment and actual usage, and future work was proposed based on the survey after using.

Keywords: Cognitive system of object, algebra and geometry; Primary school mathematics

1. INTRODUCTION

The purpose of this study is to provide a holistic solution to elementary school students' math problems at all levels by developing a cognitive system in an integrated approach of object, algebra and geometry. In recent years, with the increasing employment of technology in education and the deepening of China's reform of elementary education through technology, the exploration into leapfrogging development of China's elementary education has been well put on the agenda[1]. Such a kind of development refers to the rapid development enhanced through the application of ICT's and by observing the educational and cognitive law. Grounded on the theory of language sense[2], great achievements have been made in language learning[3, 4]. However, technology-driven math education in China still remained to be under-investigated. Over the years, teachers and researchers have gotten to realize that substantial developments can be achieved in math education through the support of educational tools for delivering math content across the spectrum of all grades.

To date, technology-supported math tools have been utilized to address one or several aspects in the knowledge system of elementary math education. Much desirable is a complete system that can narrow the gap by supporting the teaching of math across the elementary grades. The proposed system in this paper is a cognitive system developed based on the three types of relationships of object and algebra; object and geometry; as well as algebra and geometry, which can assist the students of all grades in resolving math related problems.

2. MATERIAL AND METHODS

We conducted our study as the following steps.

First, we conducted a meta-study of math learning technologies employed in elementary schools in four ways: (1) obtaining information about the most frequently used math learning tools through conducting interviews in the participating schools; (2). Identifying the tools through some search such engines as Google and Baidu; (3) combing the literature for such tools through the databases such as Web of Science and cnki and patent databases; and (4) searching information about such tools from media coverage.

Second, after the tools were identified, they were downloaded on the local computer based on a preliminary judgment, installed on the computer, and their functions were identified.

Third, knowledge units were listed in a sequence of the units in China's elementary math courses. They were then tested in the identified software applications to see whether they were able to effectively support math learning. Also, the scale of the coverage of knowledge units in elementary math education was statistically recorded.

Fourth, a new approach to categorizing math knowledge units was employed. In this approach, all math knowledge units in elementary education were categorized into object, algebra, and geometry. Such a categorization can eliminate the pitfalls of the conventional exclusive way of categorizing the knowledge units, which can place all math knowledge units into an inclusive number of knowledge points and makes it possible to support math learning with technology.

Fifth, a cognitive system was developed based on the categorized knowledge points and the functional features of math learning tools. In the process of the system development, different models were employed in the system based on the diverse types of knowledge points. In this study, dozens of models were established such as encounter models, weight models, sequence models, box models, coordinates models, evaluation models, favorite models, RMB models, item production and web-based distribution models, congregation models, algebra, object and abacus models, etc. This study focused on the elaboration of the most frequently used encounter model.

Finally, the newly developed system was tested in five elementary schools. In order to identify the effectiveness of the system, a questionnaire survey was conducted and an interview was administered.

The survey involved its usefulness, novelty, innovativeness, characteristics, stability, ease of use, and knowledge coverage. In participant selection, the teachers of math across the spectrum of six grades were selected with an identical number in each grade in order to maintain an equal number of participants across the six grades. The large majority (98%) of the participant math teachers had at least five years of

teaching experience. Among the participants, there were 71% of the teachers who taught math for more than ten years. As older teachers generally had a better understanding of teaching content, objectives, and requirements, and they were also more experienced in teaching the subject, their participation in the survey can, to some extent, help make the survey results more convincing. The results of the survey and the interview with the more experienced teachers of math were statistically analyzed.

3. RESULTS

The detailed analysis about elementary math and our cognitive system are given as below.

3.1 Analysis of Primary Mathematics Tools

With the development of in-depth integration between information technology and mathematics curriculum, many research institutions at home and abroad have developed lots of applications of tools and software for mathematics learning. The most commonly mentioned in the literature were the "Geometer's Sketchpad[5]," " Z+Z Intelligent Education Platform [6]", "Jinhua Branch of Mathematical platform[7]" There were also "Primary Mathematics companion[8]", "graphing calculator[9]", "Logo language[10]", "geometric reasoning[11]" "Mathematics[12]", "MP_Lab[13]", "PG_Lab[14]" and "DM_Lab[15]", “children's enlightenment master[16]”, “child star of the Enlightenment of gray ducks[17]”, “Oral Calculation King[18]”, “Haifeng learning courseware[19]” and other educational software, as well as abroad “Bingo[20]”, “ClueFinders ® 3rd Grade Adventures ™[21]”, “Math Workshop[22]”, “Carmen Sandiego Math Detective[23]” and other math games. These learning tools focus on more middle school mathematics than primary school mathematics. Concerned from all the content of primary mathematics, the only supporting software was "Primary Mathematics Companion [8]", others could only support several aspects of primary school mathematics content. On the research situation, the sum of all the software in the inquiry learning researched, cannot meet the entire contents of primary school mathematics, encounter problem was one of them. "Primary Mathematics Companion [8]" software covers all primary mathematics, but it is primarily used to consolidate knowledge and practice evaluation software, so in the true support of the students to obtain knowledge of inquiry-based learning there is a great development space. Some of the mathematical learning tools through the game means to attract students, but the game almost entirely in the fight its way through the nature of measurement, games in the provision of fine images and the introduction of the scenes is very worthy of learning, but require a certain degree of math students knowledge acquired, the direct support of students learning mathematics are still inadequate. The detailed analysis can be seen from my PhD thesis.[24]

From the LFDE in Primary Mathematics Learning, teachers of primary school math mentioned that encounter issue was one of the key cruxes that had not been covered. Because the kids have little experience in this area of practice, the actual situation of doing bidirectional movement is uncontrollable. The ideal tool described by teachers was through interactive, multimedia animation-like inquiry-based learning tool, but unfortunately, generally cannot find this ideal tool for the exploration.

Hence, the existing tools for mathematics learning in terms of content adaptation cannot meet learning needs of all the contents of Primary School Mathematics Curriculum Standard. Among these relevant blind spot tools, primary math encounter problem was one of the central issues. It is just from this need, the author proceed to develop tools to support inquiry encounter problems as a starting point to explore the primary school mathematics learning support software design concepts and development model.

3.2 Design and Model Structure of Our Cognitive System

From above research about learning tools of primary school mathematics, we found that none of them were programmed by C#.Net, and we decided to design our cognitive system of object, algebra and geometry on the base of C#.Net with the version of 2005 according to the nature of math. Our cognitive system was mainly used to aid the teaching of teachers of primary mathematics. And the complex operations would not be a problem in the using of it.

We tried to construct the object oriented union model to achieve the understanding of the nature of object, algebra and geometry. There were three creative things we did: First, we proposed the common base class of object, algebra and geometry, and defined the attributes and methods of the base union class, all the objects within primary school mathematics could be made through the inheritance of the common class. Second, we developed more than 100 mathematical tools based on programming language of C#.Net. These tools could assist teachers of primary math to display and operate most basic object, algebra and geometry of mathematics and the relations among them. Third, we provided a common platform for all these tools, teachers and students could explore mathematical experiments through this platform. And the platform was open and sustainable. Users could adjudge them according their favor.

3.2.1. The theoretical basis of designing primary mathematics learning supporting software

The design ideas of inquiry-based tools of primary mathematics were mainly from mathematical experiments exploring theory.[25] Mathematical experiments mainly existed in research of ion chromatography [26] and on film systems (exchange of experience)[27] or for computing translation coefficients [28]. The research in area of mathematical experiments exploring theory was little. The reason of few scholars to study in this area was that most people believed that mathematics did not require the physical and chemical tests. In fact, mathematics had its own laws, which can also be understood through experiments. Yet, available mathematical tools for experiments are few on the one hand, on the other hand, it did not have the dynamic physics experiment, nor did chemical experiments can generate new material, resulting in less experimental study of mathematics. From the view of human understanding laws, the experiment was a very good means of understanding laws.

The proponent of the theory believed that the majority of the current mathematics teaching was in the development stage of "Presented theorem - Inference Verification - Applications", and it lacked of the stage of "Observation, Measurement or Experiment –Discovery Rules- Made Hypothesis ", this mainly because of the lack of experimental tools, particularly the hands-on experimental tools to facilitate the students themselves. The theory was that an object or issues in mathematical research should be placed on a dynamic lab environment in mathematics teaching, and discovery teaching should be approached to the concept of exploratory questions from the view and method of "dynamic". The theory also believed that the dynamic mathematics teaching consists of three basic questions: dynamic experimental mathematical environment; dynamic views and dynamic ways; inquiry and discovery learning.

The inquiry-based tool of encounter problems of

moving in primary mathematics should serve in "independent, inquiring, co-operation" for teachers and students. In turn the mathematical simulation model of learning could be used to achieve in-depth integration of information technology and primary school mathematics curriculum, thus innovative spirit and practical ability of students could be truly implemented. Inquiry-based learning theory of Constructivism emphasizes that learners had their internal learning structure, and stressed that problem-solving model should be constructed according to the specific situation, to the original knowledge base. It emphasizes the whole, stressing situation, emphasizing the use of theory to solve practical problems, this is the starting point to the construction of primary school mathematics exploring tools. Mathematical experiments exploring theory raised the concept of dynamic mathematics learning.

3.2.2. The design of primary mathematics learning supporting software

Through working together over the years with the teachers of LFDE in primary mathematics, after classifying, abstracting and analysis of a dozen textbooks (PEP textbooks) of primary school mathematics, based on the logical integrity of the content of primary school mathematics, the design of inquiry learning support software were advanced as Fig. 1.

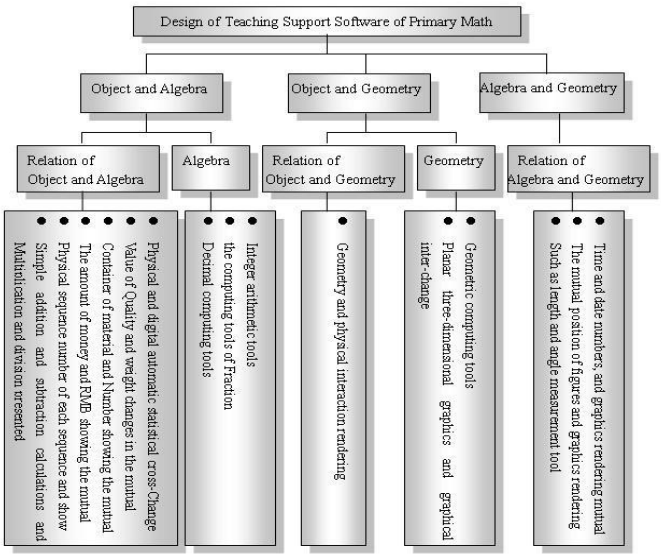

Fig. 1. Design of primary mathematics learning support software.

For example, Geometer's Sketchpad is actually a tool for geometric computing. It can calculate area, perimeter, etc.. It can do mapping, graphics, cutting, automatically generated tracking marks. It can be used for doing quizzical experiment. As another example, inquiry learning tool of encounter was actually a mutual rendering tool for digital position information and graphics.

In creating primary school mathematics exploring tool of encounter problems, the design and presentation of dynamic representation should be focused on. The students' hands-on ability and exploring ability should get more attention. In specific modeling, basis of the above design idea, the author built a logical structure of software model for primary school mathematics learning supported by Fig. 2.

The author built on this basis, design of object class and their derived classes of encounter problem for primary school mathematics are as Fig. 3.

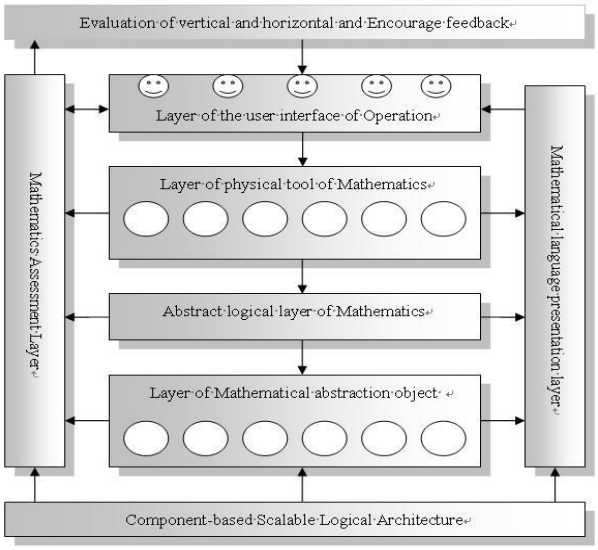

Fig.2. Logical structure of software model for primary school mathematics learning.

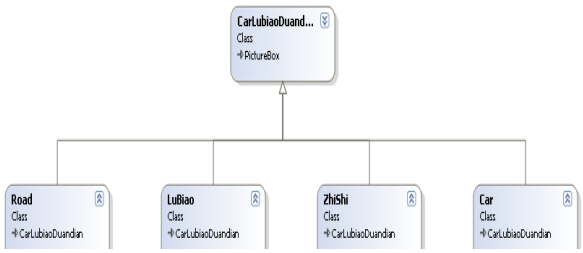

Fig. 3. Class design of car-road model

The model class includes four categories of objects, vehicles, roads, road signs, and instructions. Instruction includes arrows and their data prompt. These four categories of objects were inherited from the general category of car-road model root class in order to facilitate different objects to be called in the same way, in addition to a time object, it also can act on all objects. The model is the correlation between design objects are as Fig. 4.

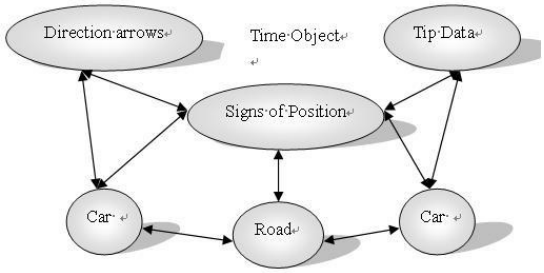

Fig. 4. Relation design of classes in car-road model

Car-road model was modeled as: A = F (R, C, L, T, Z), where A is Action, namely, car-road model to perform the action. The R is road factor, C is car factor, L is position factor in road, T is time factor, and Z is a directing factor. Among them, the specific relationship expression as follows:

R = R (p, s, l, t) p as a hint picture, s for the journey length, l the length of the image, t for the distance of road to the top。C = C (p, t, r, d, v) p as a hint pictures, t for the ratio of car position at the road's total length from left, r for the binding path, d-driving direction, v is speed. L = L (p, t, r) p as a hint pictures, t for the ratio of car position at the road's total length from left, r for binding Road. T = T (v, s, b) v for automotive

speed, s for the driving step value, b for the legend. Z = Z (p, c1, c2) p as a hint pictures, c1 or c2 was one object of the class of Car, Signs, Road and Road Position. A = A (n, s, f, fs, ts) n as no action, s to stop, f for the U-turn running, fs for the U-turn to stop, ts is time to stop.

As the signs L on the road can be set up at any position, while the action execution time T can be arbitrarily set, which ensures that users can realize the full range of vehicle control and explore. You can let the car on the road anywhere, any time of the implementation of user-defined actions. In the implementation of the action A, both U-turn driving f, can also use the fs first U-turn to stop and then start driving. This can be implemented step by step approach to achieve for any kind of topics of linear encounter problems, and it could be stopped at the right time to enable students to analyze in order to support the students to solve it. The specific model of car flow path is shown in Fig. 5.

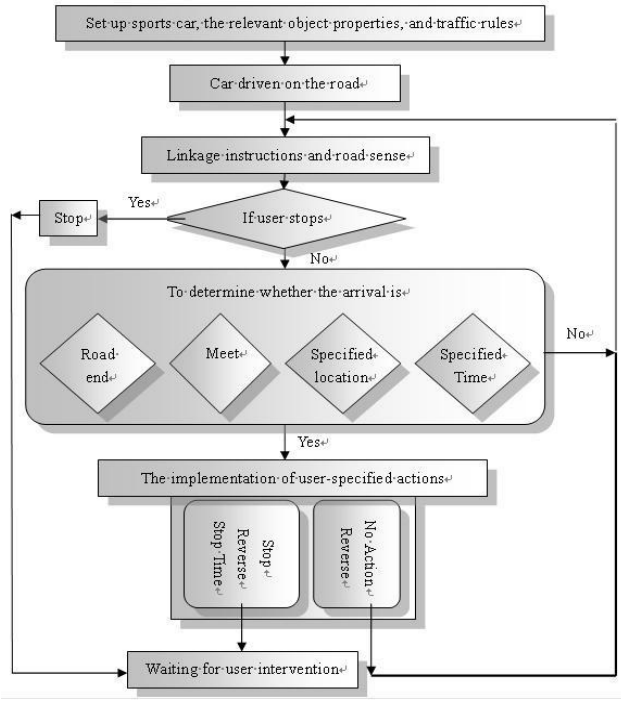

Fig. 5. Flow diagram of car-road model

3.3 The Application of Cognitive System for Primary Mathematics

We choose object-oriented C#. NET as programming language to make the cognitive system into true, we realized various specific forms of computer rendering through GDI + technology within the objects of class. We successfully displayed most relationship among the object, algebra and geometry. The structure interface and the base class and its derived class object were also realized. The whole system was a scalable hierarchical open system, and the collaborative development was more convenient. The system took the execution engine of operation as the core, took the relationship between mathematical objects as a soul, and took the operation of user as a command. The idea of the object-oriented development adopted, the system had good reusability. If you want to modify different objects about the same methods, you could simply modify the base class, which could be further overloaded by the developer. Also in class module interface, the user could absorb a variety of external resources or pictures of primary mathematics into this system through operation, this gave it a strong open. When choosing specific development platform, we used Microsoft Visual Studio 2005 as our development platform, and used C# language as a programming language, the language had an excellent object-oriented capabilities, Microsoft recommends it as the first development language. In practice of model development, we used not only the object-oriented classes, inheritance, encapsulation, etc., but also the overloading, and delegation, generics and reflection. The using of them greatly increased the program's flexibility, reusability, and maintainability.

Due to space limitations, we can not list all the mathematical objects and their relations corresponding interface. Here we still took encounter problems as an example to give brief introduction of its interface and application. Encounter problem was important and difficult in primary mathematics; more and more people began to study this problem in recent years. They put forward many solutions about how to make students feel easy when learning this problem. Yet almost all of these solutions were based on PPT or Flash. These solutions couldn't let teachers easily and voluntary control on parameters of all problems of encounter. And our encounter tool of moving was based on C#.Net; teachers could easily set all parameters about moving. The core GUI of car-road model of moving exploration tool was showed as fig 6.

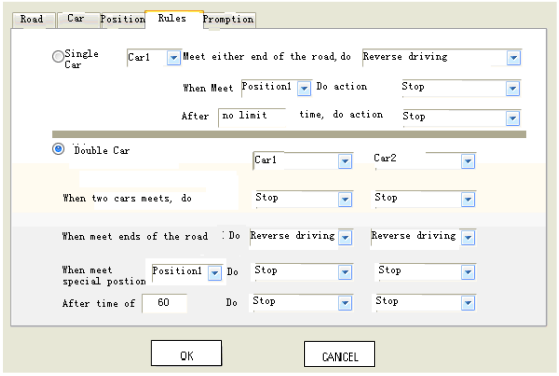

Fig. 6. Setting of car-road model

Teachers could set parameters of road, car, special position, rules and prompt through this GUI. Under the label button of rules, they could choose whether a single car moving or double car. Each kind of situation had a few parameters to be set. They could choose which double cars to run, could choose which action car should do, and could choose when car should take action. They could also choose by which condition (time or length of driving) car should take action. There were 5 kinds of actions of car could be chosen altogether. The 5 kinds of action were as following: Stop Driving, Continue Driving, Reverse Driving, Reverse and Stop Driving, Time Stop. The last action Time Stop would control both cars. The fig.7 showed the situation during driving. It also showed the entities of car-road model.

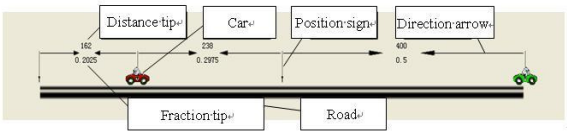

Fig. 7. Entities of car-road model

Next let's introduce the usage of it. For example, "a road had the length of 1000 meters, a red car started running from the left side of the road with speed of 8 m / s, at the same time, a green car started from the road right-hand side towards the red car with speed of 12 m / sec, when the two vehicles met, how far had the red car driven?"

First, teachers could click the Road button and Car button to

create a road and two cars, then right-click the roads or cars, select properties to set the path length or speed of their vehicles and starting position.

Second, teachers could set driving rules, select pairs of cars, and set action state of the two cars be stopped when they meet.

Third, teachers could set the property of prompt between left side and red car, and then click the prompt button to increase the instruction.

Finally, teachers should click the drive button to see the real dynamic driving conditions, driving directions digital real-time changed. Students could stop the movement of the main two at any time, and view distance.

Teachers could induce students to think and encourage students to explore why the two vehicles met at 0.4 from the left end of the road. Then, if the red car turned into the speed 4m/s, where would they meet? If you then change green car's speed to 6m/s where would it stop? Teachers might recommend students to further explore the use of this tool to verify what students thought about the results and practice, was it the same? The system could promote students to think through this inquiry exploration.

After students getting the right perceptual of questions of moving, teachers could guide students to summarize relative formula through our platform, such as distance equals rate multiplied by time. Then teachers should guide students to achieve knowledge through the formula that if we knew two parameters of distance, time and speed, we could calculate another parameter. For the question cited above, the rule summarized by students was that distance always equals both rate multiplied by time. We could calculate the time spent when the two cars met since we had known the rate of both cars and total distance, and the result was 1000/(8+12)=50, and we also knew the red car's rate was 8 m / s, so we could get the distance of red car had driven, the result was 50*8=400, and this was the answer to the question cited.

Encounter tool was only one tool of the cognitive system, which had 118 independent tools covered most objects and relationship of primary mathematics. We put this system into trial using at three primary schools in province of Guangdong, more than 1000 students and teachers attended this trial using. After trial using, we distributed the questionnaire. According to the survey, 89% of primary school mathematics teachers thought the system useful for teaching and learning of mathematics, 72% of teachers think that the platform can cover 80% of the contents of primary mathematics curriculum.[24]

4. DISCUSSION

According to the survey results, a large majority of the teachers (89%) thought that the system was useful in the teaching of math. Regarding to the novelty of the system, there were 77% of the teachers who admitted that they had never used a system of this kind before. In regard to content coverage, there were 72% of the teachers who believed that the system could cover 80% of the teaching content. There were no respondents who said that the content coverage was below 50%. With respect to the characteristics and innovativeness of the system, there were 40% of the teachers who believed that the system was characterized with its openness, learner autonomy, learner enquiry, systemic, and wide content coverage. There were 25% of the teachers who believed that the system was unique in its scoring function and feedback. There were 19% of the respondents who thought that the system was of ease of use and practicality. The rest of the respondents (16%) believed that the system enjoyed an edge in its vivid and dynamic presentation of comprehending a math problem.

Take the encounter problem learning tool as example, it implements the development of encounter problem engine of primary school mathematics, and is used in the Primary Mathematics for virtual encounter situations, which resolves the Primary Mathematics Learning in the abstract one of the difficulties - encounter problem. It provides an inquiry-based learning tool for China's primary school mathematics learning, fills a blind spot for the primary school mathematics content support tools.

Our cognitive system provided a useful platform to practice the mathematical experiments exploration theory[25], our survey of the application of our cognitive system showed the effectiveness of the theory.

5. CONCLUSIONS

Image thinking, intuitive thinking, time logical thinking were the main body of creative thinking. Object representation was a thinking material for image thinking; relationship was a thinking material for intuitive thinking. However, in the traditional school learning, time logical thinking was often only concerned about, and less emphasis on intuitive thinking and image thinking. In fact, the creative activity of the critical breakthrough depends mainly on intuitive thinking, or image thinking [29]. The inquiry-based encounter tool provided the rich object appearance and relationship representation of encounter problems involving, as the thinking material of the image thinking and intuitive thinking, it had laid a good foundation for developing creative thinking of primary school students.

The next step of this study was to continue to improve and optimize this tool. Besides, we would advance the learning mode of the tool and explore the effects of learning applications using this tool. We could foresee that the formation of the full content of primary school mathematics supporting software, and then supplemented by the scientific guidance of teachers, would solve the bottleneck problems of " barrels store water depends on a shortest plank", would certainly be conducive to a comprehensive defusing the difficulties in primary mathematics learning, highlighting the focus of learning, boosting students' hands-on operational capability and capacity of self-exploration, improving the overall quality of students, and ultimately beneficial to the overall increase of the quality and efficiency of learning primary school mathematics. From the practical point of view, a corrective tracking mechanism on mathematics learning could be constructed based on it, helping students catch the error in the end one, and then inquiry-based learning for the weak points, through intensive training to consolidate knowledge. This would greatly improve achievement of students in math. As the mathematics subjects across the curriculum was the basis for all disciplines, the cultivation of mathematical thinking and mathematical capabilities would directly benefit the nation's innovation and personnel training.

6. ACKNOWLEDGEMENTS

We thank the reviewers, whose comments have helped us improve the presentation of the paper. The paper is founded by China Postdoctoral Science Foundation (No. 20090460327) and China Postdoctoral Science Special Foundation (No.201003118).

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Creating Web-Based Animation in STEM Education

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ABSTRACT

We present educational web-based animations to facilitate teaching and learning in STEM courses. These animations incorporate engaging graphics, sound and user interaction to explain a particular topic. They have been developed by IT junior and senior students who closely worked with faculty of STEM courses such as Chemistry, Mathematics, and Biology who were interested in having animations developed for their courses. These faculty members acted as "clients" by providing a topic to the student developers, who gathered requirements, designed, developed, implemented and tested the animations.

Keywords: e-Learning, STEM, animations, games, web-based learning.

1. INTRODUCTION

Learning style dimension refers to the individual's unique approach to learning based on strengths, weaknesses, and preferences [22]. This area has historically been active on research since it has a direct impact on students' understanding of academic material [1, 2, 12, 14, 15]. Research results have concluded that students learn in many ways, such as seeing and hearing, reflecting and acting, memorizing and visualizing [1, 2, 3, 12]. Teaching methods also vary, and students respond better when an instructor's teaching style matches their learning style [12, 13, 16, 17]. According to [1], the predominant teaching style in college is auditory, or a visual representation of auditory information (words and mathematical symbols written in texts and handouts, on transparencies, or on a chalkboard). Mismatch of learning and teaching style leads to poor student performance as well as frustration inside and outside of the classroom, which eventually results in a loss of potential scholars, many of them in STEM-related fields [3, 5, 6, 7]. On the other hand, the U.S. Department of Labor, Bureau of Labor Statistics projects high growth rates in STEM fields for 2008 through 2018[8]. According to the report, projected growth occupations include biomedical engineers, network systems and data communication analysts, life scientists, medical scientist, biochemists, computer software specialist, and theoretical and applied mathematicians [9]. As STEM-related occupations are essential to remain competitive in the global marketplace and support continuous economic growth, it is critical to produce graduates in STEM-related fields, who are prepared to join the workforce.

In order to recruit and retain students in STEM fields, research results indicate that it is important to provide innovative teaching techniques, which utilize visualization [3, 4, 5, 6, 7]. The traditional visual materials such as pictures, diagrams, sketches, process flow charts and network diagrams are stationary and thus, they are rigid, lack interactivity and are not suitable to show time-based processes. To this respect, computer animations are a valuable educational tool since they combine attractive interactive time-based graphics with sound to create a rich learning experience. These animations have been successfully used by computer science faculty to teach subjects such as data-structures and computer algorithms [6, 18, 19, 20, 21]. In contrast, faculty in non-computer related disciplines lack the skills to create animations, so it is crucial to have collaboration between educators in computer-related fields with those in other areas.

Even though educators have realized the importance of using visualization, interactive visualization tools such as web animations, they have not been widely used to assist with the teaching of STEM courses mainly because of lack of resources. As a result, little research has been conducted to study the actual impact of using interactive visualization tools to meet the needs of different student learning styles [2, 4]. Answers to questions such as "To what extend does using animation tools help engage students?" or "To what extend do they improve student performance?" remain unclear. In this paper, we present a pilot project that demonstrates the collaboration between IT and other disciplines to develop web animations to assist with the teaching and learning in STEM courses. In addition, we also show preliminary research results on the impact of these animations on student's learning outcomes through qualitative and quantitative analysis.

2. PROJECT PLANNING

In this project, we present educational web-based animations to facilitate teaching and learning in STEM courses. These animations incorporate engaging graphics, sound and user interaction to explain a particular topic. They have been developed by IT junior and senior students who closely worked with faculty of STEM courses such as Chemistry, Mathematics, and Biology who were interested in having animations developed for their courses. These faculty members acted as "clients" by providing a topic to the student developers, who gathered requirements, designed, developed, implemented and tested the animations. These animations have the potential to impact not only the faculty clients and their students but also other faculty who teach the same topics. In addition, student developers gained valuable experience on research methodology as well as technical skills in graphics design, web animations and programming.

Once an animation on a particular topic is completed, faculty members can use it to teach that topic in their course. Pre and post quiz survey data are collected to determine the impact of

using animations in the teaching/learning stage. These data give insight of how web-animations affect student learning and engagement.

3. IMPLEMENTATION

Recruitment. We recruited four senior IT students to enroll in an interdisciplinary research project to develop web-based animations for STEM courses. These students had previously completed the course "Computer Graphics and Multimedia," where they were exposed to applications used to create web-based animations. Conversely, we employed six STEM faculties in the areas of Chemistry, Mathematics, Biology, and Exercise Science, who provided our students with topics in related areas. These faculties were referred to as "clients".

Development. Student developers began meeting with clients in early September, 2011. The development process was as follows. Developers meet with the client. During the meeting, they gather requirements and come up with a sketch or rough design document. The next step consists in the discussion of ideas with fellow developers and research faculty. Later, they create a prototype animation and ask researchers and clients for feedback, which usually results in minor modifications or error fixes rather than drastic changes. After the prototype is approved, students work on the testing phase, to ensure the delivery of a reliable product. After full completion, the animation is uploaded into the project's website, to make it available to all faculty and students. Development phase ends with the developers' formal presentation of the animation to the client(s).

Data Collection. Once the animation is approved, the client uses it in his/her class. Researchers and clients prepare pre and post surveys to measure the effectiveness of the animation as a teaching and learning tool. The client's students will then proceed to fill out the pre-survey, use the animation and complete the post-survey.

4. RESULTS

The development phase lasted two semesters and produced 10 animations. These animations were presented to faculty clients as well as to the general audience of the Science Technology and Research Show (STaRS), which is sponsored by the School of Science and Technology at Georgia Gwinnett College to promote STEM disciplines.

The finished product consisted of 4 animations in the area of Biology, 3 in Mathematics, 2 in Chemistry, and 1 in Exercise Science. We now provide a brief description by area.

Biology

- The first animation is *Pompe's disease* (Figure 1), which presents an illustration of a muscle cell with glycogen and glucosidase in normal conditions and explains what happens when glucosidase is deficient and lysosomes glycogen are not degraded.

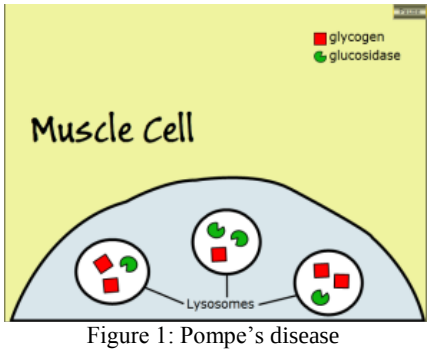

Figure 1: Pompe's disease

- The second animation *The cell and its parts* (Figure 2), shows a diagram of a cell explaining each part one at a time allowing the viewer to pause the animation at any time.

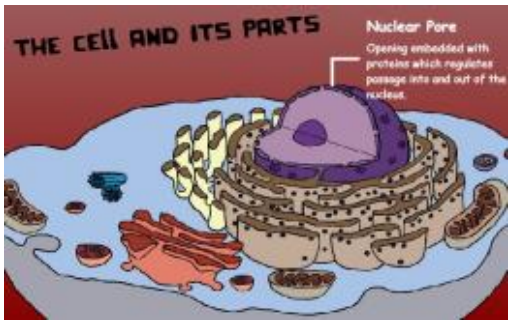

Figure 2. The cell and its parts.

- The last two biology animations explain the physical phenomenon of Nuclear Magnetic Resonance (NMR) (Figure 3).

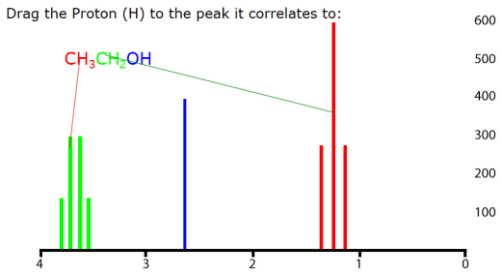

Figure 3. Nuclear Magnetic Resonance (NMR).

Mathematics

- The initial animation is Symmetry of Squares (Figure 4), which displays a square with corners labels 1 through 4. The square can be rotated 90°, reflected over X and Y axes as well as diagonally. Compound operations involving several rotations and reflections are also supported.

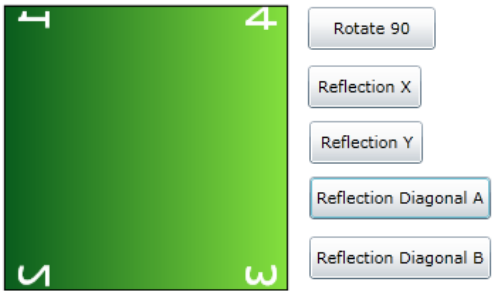

Figure 4. Symmetry of squares.

- The next animation (Figure 5) displays the Cartesian coordinate system with several well-known functions such as $\sqrt{x}$, x^2, x^3, $|x|$, etc. The user can experiment with the graphs by clicking buttons, which allow to visually see the differences among f(x+1), f(x-1), f(x)-1, f(x)+1, etc.

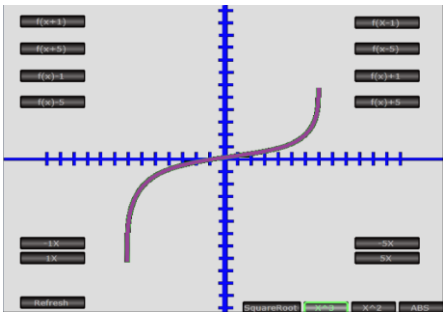

Figure 5. Algebra functions.

- The last animation (Figure 6) illustrates the central limit theorem by allowing students to experiment by rolling several dice and comparing results of multiple experiments.

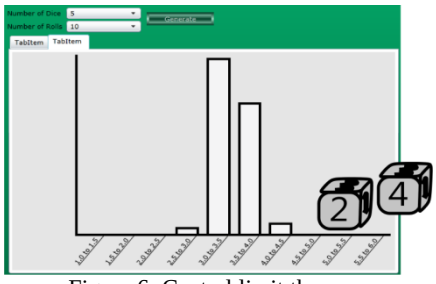

Figure 6: Central limit theorem

Chemistry

- The first animation is Hydrohalogenation (Figure 7), which illustrates the electrophilic addition of hydrogen chloride.

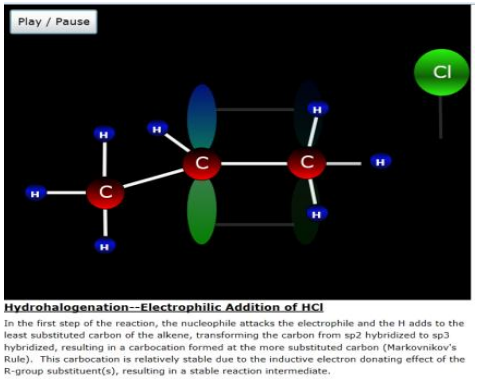

Figure 7: Hydrohalogenation

- The second animation provides an overview of the metric system, how to use it and its differences with the United States customary units (Figure 8).

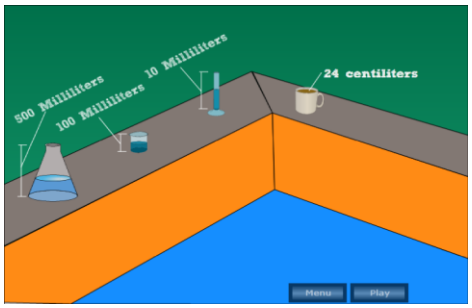

Figure 8. Metric system.

Exercise Science

- An interactive animation for muscle contraction allows students to visualize the differences between ipsilateral, posterior and contralateral movements (Figure 9).

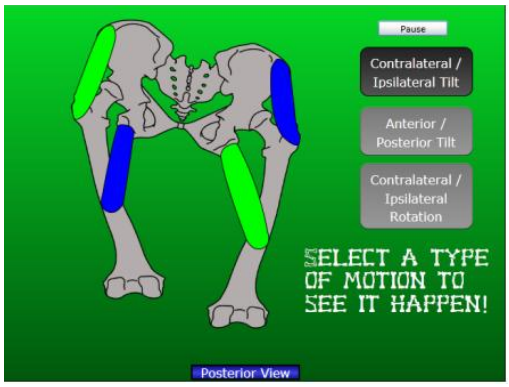

Figure 9: Muscle contraction

5. PROJECT REFLECTION

All faculty clients gave positive feedback about the professional manner in which student developers worked as well as the quality of their final animations. In the final project report, student developers also expressed positive view of the overall development of this project. The animation project allowed students to acquire the following:

- Ability to develop and test the animations.
- Ability to document the IT solutions.
- Ability to utilize the web and other open-source tools to collaborate during IT research.

In addition to the acquisition of IT skills, they stated that this project also promoted their problem solving, and soft skills which include:

a. **Communication**. Students had to setup multiple meetings with each faculty client during the development cycle in order to:

- Discuss the initial animation idea and gather client requirements.
- Demonstrate the animation product, gather feedback and modify the product (repeatedly).
- Deliver the final product to the client.

Students also needed to communicate with faculty supervisors to report the development progress and discuss the challenges they have encountered.

b. **Critical thinking and creativity**. Students needed to interpret the client's idea and convert it into an animation that satisfied the client's needs.

c. **Collaboration**. Students worked in groups for some of the animations. In order to complete the animation, they had to communicate and collaborate with each other. Even though some animations were completed individually, students discussed the technical difficulties with other developers and assisted each other to meet the deadlines.

d. **Time management**. As junior and senior students, developers took multiple number of higher level IT courses, which require significant amount time. Moreover, all of them were also working part time, which made it difficult to find time to work on the project unless appropriate time management skills were utilized. According to our students, time management has become one of the biggest challenges, and this project provided an opportunity for them to improve. They believe such experience was beneficial to their future career.

6. CONCLUSION AND FUTURE WORK

The entire project produced ten animations for STEM courses. The results have shown at presentations on campus, which generated a broad interest from faculty. We plan to continue recruiting students and develop more animations to build a repository of animations for different STEM courses at various levels.

We have also designed pre and post surveys to evaluate the effectiveness of those animations. In the future, we will conduct

research:

- To investigate students' learning behavior and preferred learning style in STEM courses.
- To investigate the effect of visualization, particularly web animation, in teaching/learning STEM concepts.

We will also collaborate with faculty "clients" to conduct surveys and interviews in order to discover the effectiveness of the animations.

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Aligning African Computing Disciplines' Graduate Attributes with International Standards

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ABSTRACT

This paper explores graduate attributes as is required of students in Computer Science and Information Systems disciplines in Africa in general and in South Africa in particular. Graduate attributes as envisioned by students and employers internationally are discussed to indicate the importance of graduate attributes from both of these groups' perspective. This discussion is followed by insights specific to computing disciplines in Sub-Saharan African countries. An overview of the graduate attributes required by the South African National Qualifications Framework and the South African Qualifications Authority is compared to the attributes suggested by the Association for Computing Machinery for computing syllabi. It is felt that this may help African and in particular South African computing departments to self-assess their programmes in terms of international standards.

Keywords: Graduate Attributes, National Qualifications Framework (NQF), South African Qualifications Authority (SAQA), Computing, Computer Science, Information Systems, Information Communication Technology (ICT).

1. INTRODUCTION

What skills must a graduate have to be able to function in the fast changing computing environment of the 21st century? What knowledge-base will give the graduate the edge to excel in a working career? These are the questions currently being asked by many, also in the computing world, who are re-evaluating what attributes constitute a graduate in 2012. In 1997 the South African Department of Education in a white paper defined the following graduate attributes as a goal with regard to the transformation of higher education: "… graduates with the skills and competencies that build the foundations for lifelong learning, including, critical, analytical, problem-solving and communication skills, as well as the ability to deal with change and diversity, in particular, the tolerance of different views and ideas …" [13]. The word "graduateness," although relatively unfamiliar, epitomises the complex concept of graduate attributes into a single term.

Graduateness is the achievement of learning outcomes and attributes that equip students to be innovative and effective in the workplace and active and informed citizens when they have completed their qualifications. Graduateness is furthermore the unique outcome of broader societal socioeconomic and geopolitical alliances [3], the vision, mission, product qualification mix (PQM), pedagogies, institutional reputation, discipline-specific reputation in the context of a specific higher education institution, the reputation of individual lecturers and their own reputation, the characteristics, commitment and endeavours of individual students and, lastly, the relevance of the qualification in the context of employability and research. This means that graduateness is the result of a range of interrelated, interdependent and mutually constitutive variables at a specific time in a specific socioeconomic and geopolitical context [4].

This paper surveys graduate attributes as is required of students in Computer Science (CS) and Information Systems (IS) disciplines in Africa in general and in South Africa in particular. First, graduateness as envisioned by employers is discussed to

indicate the importance of graduateness for both employers and students in the global context. Next, an overview of the graduate attributes required by the South African National Qualifications Framework (NQF) and the South African Qualifications Authority (SAQA) is provided. The Association of Computing Machinery (ACM)'s curricula for CS and IS are then mapped to the Higher Education Qualifications Framework (HEQF) and SAQA principles. This mapping may help African computing departments to self-assess their programmes in terms of international standards and can be a preparatory phase towards international accreditation if desired. The paper concludes with insights on the socioeconomic context of Sub-Saharan African countries that can inform graduateness in this context.

2. GRADUATENESS AND EMPLOYABILITY: AN INTERNATIONAL PERSPECTIVE

Graduateness is concerned with a set of qualities that marks a person who has undertaken a degree course, whereas employability has an immediate practical concern relating to the way in which graduates can be assimilated into employment. In their study of university students in the United Kingdom, Glover et al. [6] found that for students "*…economic motivation is more important than the pursuit of knowledge…*" and that students do not see graduateness by itself as a sufficient basis for continued personal investment in university education. As a result, there is an increasing expectation amongst students and prospective students that higher education be directed towards improving their employability and thus their future employment prospects. This finding suggests that there is tension between graduateness and employability but it is debatable whether this tension is valid and legitimate.

In their employer satisfaction research, Harvey and Knight [7] found that employers were looking for transformative potential in graduates and they highlighted the following important graduate attributes: knowledge; a willingness to learn; the ability to work in a modern organisation; interpersonal skills and communication. In an industry panel discussion at the Midwest Association for Information Systems (MWAIS) in 2011 in Omaha, Nebraska, all three panellists[1] confirmed the continued validity of the attributes that they most seek in CS/IS employees, namely, foundational skills and an understanding of the fundamental concepts of the discipline (rather than just the latest technology) in order to be able to engage in meaningful problem-solving and designing innovative solutions [9]. At a subsequent keynote at the same conference the Managing Director of Information Technology (IT) at *TD Ameritrade*, Bob Beck, indicated that apart from core technical skills there are several other skills that are vital for continued career success in his company: the ability to work in and with teams; to deal with cultural diversity; to communicate effectively; to engage in cognitive thinking and to learn adaptively [9]. According to Beck, CS/IS programmes should:

- *Teach the basics, that is, reading, writing and arithmetic*
- *Coach collaboration through more emphasis on group projects*
- *Focus on 'business first, technology second' because of the importance of functional expertise*
- *Emphasise written and verbal communication, especially interpersonal interaction*
- *Inculcate understanding of global cultures, including social and political aspects*
- *Establish lifelong learning by instilling the desire to continue improving* [9]

In order to reach and concretise these general aims of computing programmes, colleges and universities may use the ACM curricula for the computing disciplines. These curricula have a long history of more than forty years and have been used widely to evaluate syllabi for the purposes of quality assurance and accreditation. Various curricula exist, including Computer Science, Information Systems, Information Technology, Computer Engineering and Software Engineering. These curricula are available at http://www.acm.org/education/curricula-recommendations. The Computer Science and Information Systems curricula will be used below to align the content of tertiary outcome guidelines in South Africa with international standards. This comparison may be used to plan computing programmes and to evaluate existing programmes against these benchmarks.

Whilst students in CS/IS may understandably be more concerned with their future employability than a well-rounded education and attaining graduateness, employability and graduateness is becoming much more closely integrated globally, although employability does not necessarily include a commitment to ethical practices or in showing responsibility to the environment and others [6]. Although students may not yet clearly understand that by pursuing graduateness they could contribute to satisfying their economic motivation for pursuing higher education, that is, employability, evidence suggests an increased desire by employers for graduate attributes in addition to core knowledge and disciplinary skills. It may well be that the recruitment practices and job descriptions of employers do not adequately communicate these expectations to their future employees and thus students and prospective students are not sufficiently aware of this altered state of affairs. The next section discusses graduateness within the context of South African higher education.

3. GRADUATENESS IN THE SOUTH AFRICAN CONTEXT

Whilst governments have a broader responsibility to ensure accountable citizens, they are also tasked with ensuring that they are able to supply the skills necessary for their national economies to be competitive in the global economy. All higher education institutions in South Africa, whether at traditional residential or distance learning institutions, are obliged to produce graduates that meet the requirements of the HEQF and SAQA regarding the exit level and critical cross-field level outcomes. Therefore all graduates from South African universities are expected to have the characteristics contained in the 'draft level descriptors' extracted from the Higher Education Act No. 101 of 1997 [14], represented verbatim in the first column of Table 1. Add to this the NQF critical cross-field outcomes [10], such as :

[1] Panellists were Gerrit Schutté, Senior Vice President and CIO of *ConAgra Foods*; Anthony DeCanti, Vice President and CIO of *Werner Enterprises*; and Jake Chambers, a progam manager at *Google*.

- *Identifying and solving problems in which responses display that responsible decisions using critical and creative thinking have been made*
- *Working effectively with others as a member of a team, group, organisation, community*
- *Organising and managing oneself and one's activities responsibly and effectively*
- *Collecting, analysing, organising and critically evaluating information*
- *Communicating effectively using visual, mathematical and/or language skills in the modes of oral and/or written persuasion*
- *Using science and technology effectively and critically, showing responsibility towards the environment and health of others*
- *Demonstrating an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation*
- *Reflecting on and exploring a variety of strategies to learn more effectively*
- *Participating as responsible citizens in the life of local, national and global communities*
- *Being culturally and aesthetically sensitive across a range of social contexts*
- *Exploring education and career opportunities*
- *Developing entrepreneurial opportunities*

The combined characteristics of these two sets provide a very comprehensive profile of the ideal graduates in the South African context. The HEQF's set of characteristics deals with the quality and scope of graduates' knowledge, the problems they should be able to solve, how they should gather and interact with information, how they should be able to communicate and how independent they should be in their learning. The critical cross-field outcomes deals with the so-called "softer'" issues focusing on creativity, group work, self-efficacy, showing responsibility towards the environment and the health of others, systems thinking, reflectivity, and citizenship.

In the next section the internationally required outcomes of computing degrees (as defined by the ACM curricula for CS and IS [2;15]) are mapped onto the South African defined graduate attributes.

4. MAPPING HEQF/SAQA GRADUATE ATTRIBUTES ON THE REQUIRED OUTCOMES OF ACM CURRICULA

In Table 1 the outcomes of the IS and CS graduate programmes as required by the ACM curricula are mapped onto the HEQF and SAQA graduateness guidelines in order to reveal similarities and disparities. Some of the phrases in Table 1 are direct quotations from the referenced documents, while others are paraphrased or summarised.

Table 1. Mapping HEQF/SAQA Graduateness Characteristics on NQF Critical Cross-Field Outcomes and the ACM IS and CS Curricula's Graduate Attributes

HEQF/SAQA exit level outcomes on NQF level 7 (bachelor's degree)	NQF critical cross field outcomes	IS2010 [15] (Outcome expectations for IS graduates, pp. 15-23)	ACM Computer Science curriculum 2008
1a. A well-rounded and systematic knowledge base in one or more disciplines/fields	Using science and technology effectively and critically	Foundational and IS specific knowledge and skills; understand limitations of technology and related resources	High-level understanding of systems as a whole; knowledge and understanding of essential facts and concepts
1b. And a detailed knowledge of some specialist areas		Understanding fundamental organizational processes; domain fundamentals: business, government, health care, legal profession, etc.	Attention to rigorous thinking; knowledge and understanding of modelling and design
2. A coherent and critical understanding of one or more discipline/field's key terms, rules, concepts, principles and theories	Using critical thinking for responsible problem solving	Becoming experts in high level design and management of IT capabilities	Critical evaluation and testing
3a. Ability to map new knowledge onto a given body of theory	Demonstrating an understanding of the world as a set of related systems	Analysing legal and ethical implications of complex situations	Appreciation of the interplay between theory and practice
3b. An acceptance of the multiplicity of 'right' answers		Identifying and evaluating solution and sourcing alternatives	Significant project experience, showing the ability to integrate and apply principles and skills

Table 1. Mapping HEQF/SAQA Graduateness Characteristics on NQF Critical Cross-Field Outcomes and the ACM IS and CS Curricula's Graduate Attributes

HEQF/SAQA exit level outcomes on NQF level 7 (bachelor's degree)	NQF critical cross field outcomes	IS2010 [15] (Outcome expectations for IS graduates, pp. 15-23)	ACM Computer Science curriculum 2008
4a. Ability to deal with unfamiliar concrete problems and issues using evidence-based solutions	Identifying and solving problems; participating as responsible citizens in the life of local, national and global communities	Designing revised processes	
4b. Ability to deal with unfamiliar abstract problems and issues using theory-driven arguments		Appling principles of process analysis to specific situations	Adaptability: possess a solid foundation to maintain skills as field evolves at fast pace
5a. Well-developed information retrieval skills	Collecting... information	Researching and applying industry reference models; integration of data	Information retrieval and management skills
5b. Critical analysis and synthesis of quantitative and/or qualitative data	Analysing, organising and critically evaluating information	Analysing existing processes; analysing information needs of organisation; mathematical foundations	Numeracy
5c. Presentation skills following prescribed formats,	Displaying critical and creative responses to problems	Observing, report writing, collaboration tools, presentations	
5d. Using IT skills appropriately	Developing entrepreneurial opportunities	Understanding how to use data to improve processes; seeing new opportunities to create value faster	International competitiveness
6a. Ability to present and communicate information and their own-ideas and opinions in well-structured arguments	Using and displaying creative thinking for responsible problem solving	Negotiating solutions that satisfy the political requirements for new processes	Communication and presentation skills
6b. Showing an awareness of audience	Showing responsibility towards the environment and health of others; being culturally and aesthetically sensitive across a range of social contexts	Customising processes to address cultural and ethnic needs	Being guided by social and cultural issues
6c. And using the academic/professional discourse appropriately	Communicating effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation	Negotiating with other role players about funding, service levels, quality, etc.	
7a. A capacity to operate in variable and unfamiliar learning contexts	Recognising that problem-solving contexts do not exist in isolation	Leading implementation of new processes; identifying solutions to secure data	Recognition that common themes and principles have broad applications
7b. Requiring responsibility	Problem-solving that displays responsible decisions	Understanding, managing and controlling IT risks	Professional responsibility
7c. And initiative		Assuming inspiring leadership at various levels	
8. A capacity to accurately self-evaluate and identify and address own learning needs	Organising and managing oneself and one's activities responsibly and effectively; reflecting on and exploring a variety of strategies to learn more effectively; exploring education and career opportunities		Self-management of learning, development, time and organisational skills

Table 1. Mapping HEQF/SAQA Graduateness Characteristics on NQF Critical Cross-Field Outcomes and the ACM IS and CS Curricula's Graduate Attributes

HEQF/SAQA exit level outcomes on NQF level 7 (bachelor's degree)	NQF critical cross field outcomes	IS2010 [15] (Outcome expectations for IS graduates, pp. 15-23)	ACM Computer Science curriculum 2008
9. An ability to effectively interact in a learning group	Working effectively with others as a member of a team, group, organisation, community	Leadership, collaboration and team work	Teamwork

It is clear from the comparison in Table 1 that there is high correspondence between the ideal graduate attributes suggested by SAQA and the ACM, both in IS and CS. The CS curriculum places less emphasis on negotiation and leadership skills and involvement in academic discourses, while the IS curriculum places less emphasis on rigorous thinking. However, these are limited to slight differences in emphasis. It is, actually, rather surprising that both disciplines share most of the "softer" graduate attributes, assuming and underlining the idea that these contribute to a graduate student's employability since CS is often perceived as a "harder" science than IS. The implication of the high correspondence is that South African computing departments may model their curricula on the ACM's guidelines and be sure that they also meet SAQA's requirements. The derived mapping could form a roadmap for quality assurance by CS/IS departments.

Some gaps, however, have also been identified and these need to be addressed by syllabi committees at individual institutions. In the ACM Computer Science 2008 curriculum no specific mention is made of the solving of divergent concrete problems. Report writing and presentations are also underplayed, as well as negotiation and leadership skills. On the IS side, rigorous thinking and methodology could receive more attention. The capacity of self-evaluation and of identifying one's own learning needs is not stated clearly in the IS curriculum, but it may be implicit – if the graduate would move to a new application domain, the knowledge and skills related to domain fundamentals should be acquired.

This study is limited to IS and CS curricula, and follow-up work should also look at other curricula, such as software engineering, computer engineering and ICT.

Since graduateness is situated in a particular socio-economic and geo-political context the next section considers the graduateness of computing teaching/curricula situated in the broader context of Sub-Saharan Africa.

5. GRADUATENESS AS THE RESULT OF COMPUTING TEACHING/CURRICULA IN SUB-SAHARAN AFRICA

How should the career skills and learning outcomes be integrated and interpreted in terms of the graduateness of computing students? And how should computing curricula underpin these attributes? These were the questions that were asked at a two-day summit held in Kampala, Uganda, in August 2010 [5].

The summit was attended by forty computing scholars from all parts of Sub Saharan Africa (SSA): West Africa, South Africa and East Africa. In this study South Africa is included as a SSA country; however, in many definitions of SSA, South Africa is excluded because it is felt that the Western European influences are much stronger in South Africa than in the rest of the region. "SSA begins immediately south of the Sahara Desert below the Tropic of Cancer (latitude 23½° N) through the Equator down to 35° South, just north of South Africa. North Africa is not included in this region, as it resembles the Middle East much more than the rest of Africa" [8].

The aim of the Ugandan summit was to determine what graduate attributes are required of SSA graduates and whether there are requirements that are particular to SSA – that is over and above those defined by the ACM (Association for Computing Machinery) [1]. For example, graduates from SSA should be entrepreneurs (much more than their counterparts in the developed world) and should be able to build their own information technology (IT) businesses, since small and medium enterprises (SMEs) have proven to contribute significantly to the economic growth in the SSA region [11]. Apart from the computing academics who were invited to the summit, three local Ugandan (IT) industrialists were also asked to contribute on what skills the Ugandan industry requires of SSA graduates and what they felt were currently lacking.

The local business identified problem-solving skills (to tackle practical problems), being able to work independently and the ability to communicate as areas of concern. The problem areas identified by the industrialists fed into discussions on the second day of the summit. The delegates then identified seven *perspectives* (building blocks of skills or knowledge areas) they felt should be part of each SSA curriculum, namely: Science and Technology (S&T); Soft and Research skills (S&R); Society and Development (S&D); Environment (ENV); Business and Entrepreneurship (B&E); Institutional Skills (INST); and Practical Skills (PR). The delegates drew up a grid of the current status of their regions' curricula (in terms of these perspectives) and what they deemed the ideal situation would be [12].

Six academics, two each from East-, West- and South Africa, undertook to collect data about the syllabi of the computing programmes currently being taught in their respective regions. Syllabi from a total of 22 computing programmes were collected and were analysed both quantitatively and qualitatively to validate the gaps between the existing curricula and the identified perspectives. Most of the syllabi analysed were from CS programmes, the rest were from Information Technology (IT), Computer Engineering (CE), Information Systems (IS) and Software Engineering (SE) programmes.

It is not surprising that the most popular of the computing programmes in SSA is still CS (the oldest discipline among the computing disciplines) (with the exception of South Africa where IS is taught at various tertiary institutions). The weighting allocated to each of these perspectives for the different programmes were then calculated. It was determined that for a CS programme to be relevant in SSA, for example, half of the programme should constitute S&T modules with approximately

a tenth of the weight of the programme being dedicated to practical components. Furthermore, approximately a fifth of the weight of the programme should be dedicated to S&R and the rest to S&D, ENV, INST and B&E respectively. An IS programme could have even more business and other soft skills and less S&T elements. Follow-up research could explore the ideal balance. The aims of the African computing community seems to support the international drive towards delivering a balanced graduate with particular emphasis on the so-called "soft"-skills that are often neglected.

6. CONCLUSIONS

Whereas graduateness is about the unique qualities of a person who has completed a certain curriculum, employability is about improving their employment prospects as a result of outcomes achieved. This paper confirms that employers are looking for graduates with the ability to work in a modern organisation, with an emphasis on group projects and lifelong learning. Furthermore, integrative and applied learning needs to be demonstrated through the application of knowledge, skills and responsibilities to solve complex problems. These are skills and attributes that graduateness seeks to promote.

Graduates of all universities in South Africa are intended to attain graduateness by reaching exit level outcomes and delivering critical cross-field level outcomes. There is a close correspondence between the outcomes of the ACM CS and IS curricula and the HEQF/SAQA exit level outcomes and the critical cross-field outcomes on NQF level 7. Some gaps were identified that need to be filled by higher education institutions. Furthermore, graduateness is the unique outcome of the strategy followed, the programmes as a result of the strategy followed and the risk management practices of the higher education institutions. Each program and, more specifically, each curriculum has a unique weighting of attributes, based on context that gives its students a unique blend of capacity. In a Computer Science program in Sub-Saharan African countries, it was suggested by Rai et al. (2012), for example, that 50% of the program should be geared towards Science and Technology, 20% to Soft and Research skills, and the rest (30%) to Society and Development, Environment, Business and Entrepreneurship, Institutional and Practical Skills. Information Systems programmes may even have a higher percentage of soft skills.

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Impact of ICT on the Quality of Mathematical Education

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ABSTRACT

Some results of joined research projects that have been realized during 2006 – 2011 period are described in this paper. Primary goal of these projects was set as to improve the quality and flexibility of mathematical education at the university of technology by implementing of teaching models with emphasis on creativity improvement and ICT support. With the use of the proposed new teaching model study results were improved with statistically significance. Research also showed us the need for searching of new education methods that developing not only students´ cognitive abilities but their creativity, as well.

At present the research continues in the form of project planned for two years with title „ Implementation of internal quality assurance system of education". Project is granted from Structural Fund of EU.

Keywords: Mathematics, Teaching Model, Creativity, ICT, e-Learning

1. INTRODUCTION

Students of university of technology gain basic mathematical knowledge and competences within compulsory courses of mathematics. However, according to our experience, they are often not able to use them properly. Results of several years' research [1] showed us, that one of the sources of this problem is insufficient level of creativity. For example students are not able to overcome functional fixation. Therefore was necessary to implement into education process teaching model that uses methods improving creative thinking. Moreover this model broadly uses ICT with goal to yield students effective tool for mathematical problems solving that will face during following years of study and praxis.

2. RESEARCH PROJECT BACKGROUND

The main goal of this project was oriented onto improvement of quality and flexibility of mathematical education at Slovak University of Technology. The goal was planned to achieve by implementing of new model of mathematic subjects teaching with stress on creativity and ICT support and free mathematical software use, as well. This goal has been broken down into following tasks:

- To select appropriate free mathematical software tools;
- To develop teaching model that uses methods evolving students creativity and free mathematical tools software;
- To prepare e-content.
- To verify effectiveness of developed teaching model through pedagogical experiments;
- To work out recommendation for teaching model use
- To implement validated teaching model into teaching process on the base of proposed recommendations and evaluate its efficiency.

In case that students have to gain more than rough knowledge they need to be actively involved into educational process as it is known from huge amount of pedagogical and psychological research works i.e. [2], [3], [4] Students cannot remain only passive recipients of new information. Teacher is an important element in the educational process. He/she stops to be only information source and becomes a students' partner in learning process. This new teacher´s role, besides other, needs the will to teach experimentally and decrease the use of teacher´s authority. The main teacher´s task is to develop students' ability to learn, to work autonomously and use knowledge creatively. New teaching model was developed having in the mind W. A. Diesterweg´s truth: „Bad teacher gives truth, good teacher teaches how to find the truth. "

As a part of teaching model the method of knowledge acquisition with usage of methods supporting development of creative technical thinking was designed. Emphasis was put mainly on methods selection and teaching materials design that improve flexibility and overcome functional fixation. The method of knowledge examination that stresses understanding and creative application of knowledge was designed and verified as a part of new teaching model, as well. Students´ memory capacity is not assessed.

Example of learning material, part "Integral", supporting students to overcome functional fixation onto the use of letters

"*x*" and "*y*" for dependent and independent variables respectively is in the fig.1.

1. V mechanike tekutín zložky tlakovej sily na všeobecnú plochu od rovnomerne rozloženého tlaku v smere osí *x, y, z* :

$$F_x = p_0 \int_{A_x} dA_x = p_0.A_x \quad F_y = p_0 \int_{A_y} dA_y = p_0.A_y \quad F_z = p_0 \int_{A_z} dA_z = p_0.A_z \ (1)$$

2. Vo fyzike, pri výpočte rýchlosti telesa s hmotnosťou m, ak naň pôsobí sila $F = F_0 e^{-kt}$.(2)

$$v(t) = \int a(t)dt = \int \frac{F_0}{m} e^{-kt} dt = \frac{F_0}{m} \int e^{-kt} dt = \left| \begin{matrix} -kt = z \\ -k.dt = dz \end{matrix} \right| = -\frac{F_0}{m.k} \int e^z dz = -\frac{F_0}{m.k} e^z - A =$$

$$= -\frac{F_0}{m.k} e^{-kt} - A$$

Figure 1 Example of e-course task oriented onto overcoming the functional fixation

The e-study materials are part of new teaching model. Bundle of e-study materials contains: education content (additional interactive courses, e-books and published lecture texts and presentations), knowledge application (sets of solved tasks and activation exercises), and self-evaluation tasks (interactive auto tests). [5] Example of interactive auto test is shown in the fig.2.

Auto tests for each part of the Mathematics course taught in 1st study year of Bachelor studies have been developed as a tool for knowledge a competence assessment during the semester. Immediate feedback is a big advantage for the students

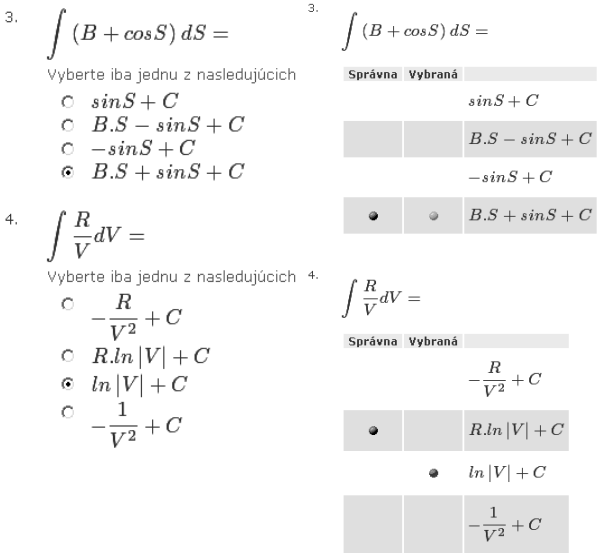

Figure 2 Example of auto test from part "Integral"

The e-study materials contain tutorials for the computational or graphical tasks solving methods, as well as guidelines for checking the tasks solutions in free software tools ***WinPlot*** and/or ***Maxima***. For illustration, graphical solution of task from "Coordinate systems" part is shown in the fig.3. Figure was created by Winplot that students regularly use in computing practice.

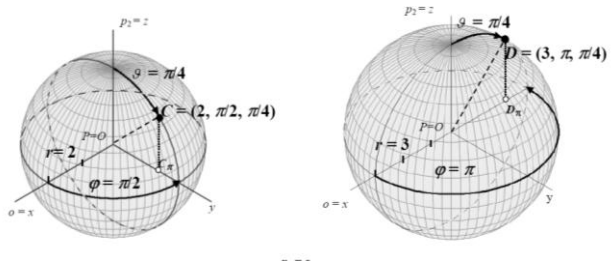

Figure 3: Graphical solution of task from "Coordinate systems" part [Math I with support WinPlot]

Multimedia programs were added to education content. They are in the form of interactive animated guides that enable the students to quickly find out hints for effective usage of mathematical software when solving stated mathematical problem.

Mathematics courses teachers proposed the content of animated guides [6], students of study program *Applied Information and Automation in Industry* realized them within thesis work. [7] They used *Adobe Flash* and *Super Screen Recorder*, that records all activities on computer screen into multimedia file in *.avi format. This format was converted to *.flv format suitable for Flash by *Quick Media Converter*.

3. RESEARCH DESCRIPTION AND RESULTS

The goal of joined research projects was set as follows:

- To verify effectiveness of new teaching model;
- To find out students´ attitude towards package of e-study materials that consists substantial part of proposed teaching model
- To implement the model into education process and evaluate its didactic effectiveness.

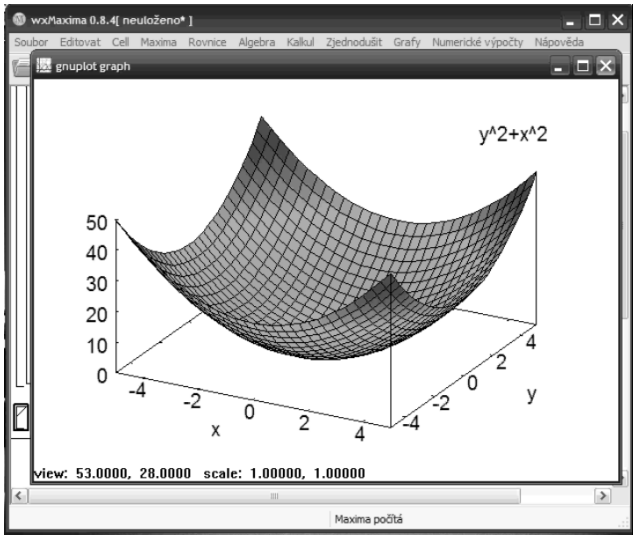

Figure 4. Example of interactive tutorial for Maxima tool

First part of research was realized during 2007/2008 academic year at the Faculty of Material Science and Technology of Slovak University of Technology in Trnava. The aim was to evaluate the new teaching model. Research sample consists of 100 first grade students of combined study of all study programs in *Analytic geometry* course. Students of analytic

geometry course from previous academic year 2006/2007 were used as a follow-up group. That year (2006/2007) the new teaching model with application of ICT was not implemented.

Following working hypotheses have been stated:

1. *Students from experimental group will score higher in didactic test than students from follow-up group.*
2. *Students will have positive attitude towards package of e-study materials and the use of it in Mathematics courses.*

For verification of working hypotheses, following tools and methods have been used:

- Didactic test – oriented on knowledge application; it covered two types of tasks: closed with prepared answers and open tasks.
- Questionnaire – prepared on the base of semantic differential; attitude has been measured by several 5-grade scales from the view of selected factors. Scales consisted from two adjectives or verbs. The adjective or verb expressing negative attitude correspond to value 1 and adjective or verb expressing positive attitude to value 5 on 5-grade scale.
- Statistical methods for research results processing – results have been processed with support of MS Excel.
- F-test for statistical hypotheses verification.

Hypothesis no. 1, assuming that students from experimental group will score higher in didactic test than students from follow-up group, **has been confirmed** when new teaching model was applied into Analytic geometry course. As it is obvious also from graph in fig.5, students from experimental group have reached higher relative successfulness in didactic test than students from follow-up group. Difference was statistical significant. Values of F-test for variance, calculated from values from absolute successfulness in test are in the table 1. Calculated value of testing criterion F is higher than critical value F_{crit}. ($F > F_{crit}$), for given degrees of freedom and chosen level of significance $\alpha = 0,05$.

Table 1: F-test values

Subject	Group	F- test			
		Mean value	**variance**	**F**	**F_{crit}**
Analytic geometry	experimental	2,75	2,23	1,68	1,54
	Follow-up	1,79	1,33		

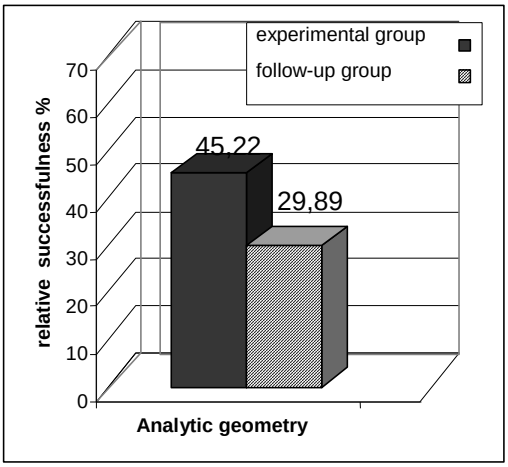

Figure 5. Relative successfulness in didactic test

The ratio of students, which successfully finished course, was increased, as well. Analytic geometry course successfully finished 81,57% of students from the group of 304 students in academic year 2006/2007. Next academic year 2007/2008, 89,74 % from group of 624 students successfully finished course. Comparison of final students´ marks is shown on graph in figure 6.

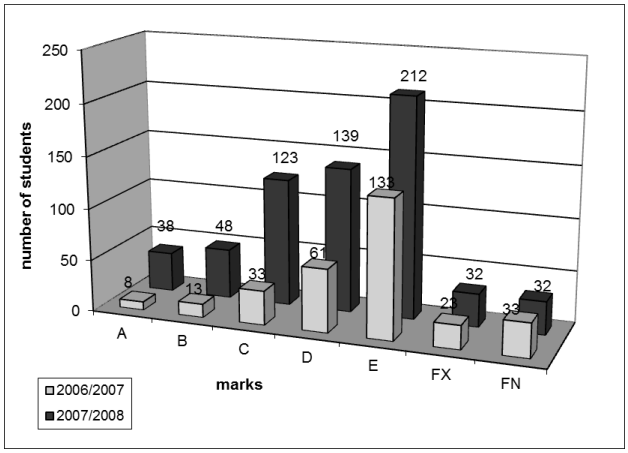

Figure 6. Comparison of final marks in academic years 2006/2007 and 2007/2008

Hypothesis no. 2, assuming that students will have positive attitude towards package of e-study materials and the use of it in learning Mathematics **has been confirmed**. Semantic profile of e-study materials is in fig. 7. Usefulness factor describes students´ attitude towards e-study materials from the point of view how the e-materials helped them in learning process. Applicability factor reflects the will to use analogical e-materials in other courses. The meaning of other factors is obvious.

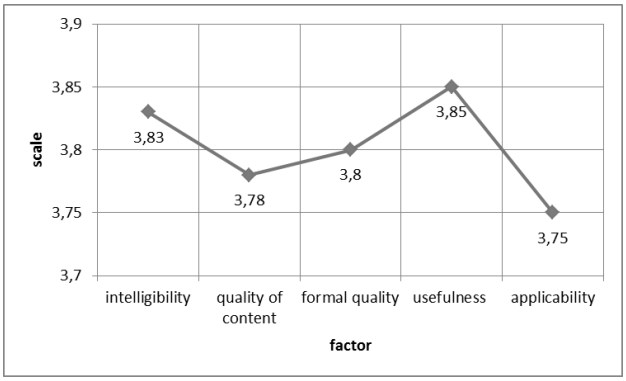

Figure 7. Semantic profile of e-study materials for Analytic geometry course

Research covered the investigation of usage degree of particular study materials types, as well. Therefore question about interactive learning materials e-lectures, e-texts, interactive self tests, and notes from lectures and consultations were placed into questionnaire. Students most often used e-lectures and e-texts with set of solved tasks and exercises during analytic geometry course study, as it can be seen from fig. 8. These materials have been used more often than material self prepared by students e.g. notes from face-to-face teaching. Doubtless, e-material enabled the students to choose appropriate time for them to study and not to take part in face-to-face teaching, because the most of the students live outside the campus. They at least used the self tests.

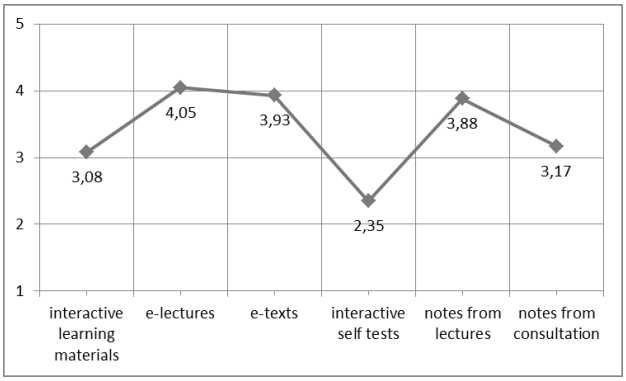

Figure 8. Usage of different study material types within analytic geometry.

Research project continued by application of new teaching model into Mathematics I course in next academic year (2008/2009). For this part of research a two-step experimental plan has been used. Students had at disposal e-lectures, presentations from lectures, e-texts with set of solved tasks and exercises and during computational exercises they could use a free software tool *Maxima*. Students of Mathematics II course had at disposal e-lectures only and computational exercises had traditional scenario without the use of software tool. The experimental group was created by 70 Mathematics I course students of 1st grade of regular study of all of study programs, follow-up group consisted of all of Mathematics II course students. The research was extended with the question: if positive correlation between attitude to the new technology in teaching of mathematic subjects and students' performance in educational test that contains tasks focused on basic creativity factors exists?

The following working hypothesis was investigated:

A positive correlation between attitude towards the new technologies usage in mathematics courses and the performance in the tests that contain tasks oriented onto basic creativity factors exists.

For verification of working hypothesis following tools and methods have been used:

- Test that contains tasks oriented onto basic creativity factors: fluency, flexibility and originality. Score (max.18) reflected the ability to overcome functional fixation, alternate the way of perception of patterns, readiness, and originality of thinking;
- Statistical methods for research results processing – results have been processed with support of MS Excel.
- Pearson's coefficient of correlation,
- t-criterion for determination of statistical significance of correlation coefficients i.e. if the correlation discovered in selected sample exists in the whole set, as well.

Research **confirmed** the **validity** of **hypothesis**, assuming that there exists a positive correlation between attitude towards the new technologies usage in mathematics courses and the performance in the tests that contain tasks oriented onto basic creativity factors.

We assumed the relation between two variables (students' attitude towards usage of the new technologies in mathematics courses and score in creativity test). In order to verify the hypothesis, the correlation coefficient between the mean values of attitude and score in creativity test was enumerated. Calculated value of correlation coefficient r=0,36 means that students´ attitude towards usage of new technologies in mathematics courses positively correlates at low level with abilities for creativity. Statistical significance of coefficient has been tested with t-criterion. For selected level of significance α=0,05 and appropriate number of freedom degrees, enumerated value was t_{stat} = -5,39. Critical value of tested criterion was t_{cr} = 1,67. Since $|t_{stat}| > t_{cr}$ it is possible to conclude that correlation coefficient is statistical significant and hypothesis **is valid**.

New teaching model was improved on the base of experiments´ results and enriched with methods supporting creative thinking and helping to overcome the functional fixation in next academic year 2009/2010. Recommendations for its effective implementation into education process have been adapted, as well. Some of the recommendations follow:

- Didactic effectiveness of teaching is higher in case the students have at disposal, in addition to face-to-face teaching, interactive on-line courses, presentations from lectures and supporting e-learning materials.
- It is suitable to develop the learning content in the form of e-lectures, e-texts and interactive modules in that the orientation is easy and needed information is easily found.
- Materials for knowledge assessment and self-evaluation are necessary to develop in such a way that the students´ abilities will be tested not theirs memory. Materials have to demand creative application of knowledge from

learning content basics and from the whole course content, as well.

- It is necessary to use the database of tasks oriented on the specific and nonspecific transfer in materials development.
- Materials for self-evaluation it is necessary to develop so that they enable the students to follow the level of their progress.

Adapted new teaching model was implemented into Mathematics I course in 2010/2011 academic year. Number of Mathematics I course students during research period (academic years 2007/2008 - 2010/2011) is depicted in table 2.

Table 2. Number of research respondents

Number of research respondents				
Academic year	2007 /2008	2008/ 2009	2009/ 2010	2010/ 2011
number	1337	1000	1070	970

Growth of relative successfulness, as it can be seen from graph in figure 9, is the result of application of new teaching model. Substantial improvement of successfulness, after implementing new teaching model, occurred in academic year 2008/2009 when compared to previous academic year. Next year the successfulness had not been changed. The next positive change occurred when adapted teaching model was implemented.

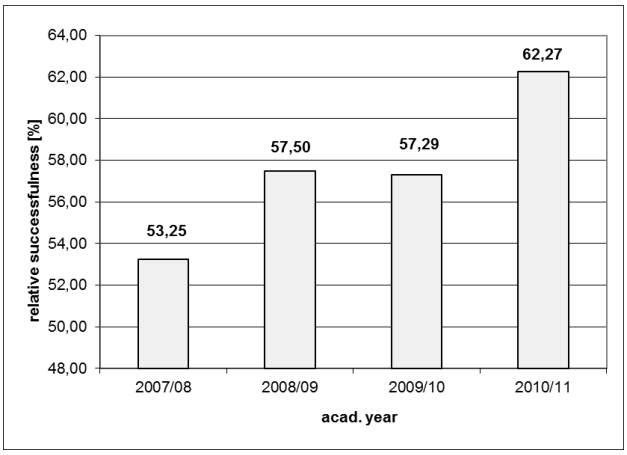

Figure 9. Relative successfulness of students in Mathematics I course

4. CONCLUSIONS

Set of research experiments oriented onto improvement of the quality and flexibility of mathematical education was realized during 2006 – 2011 years period at the Faculty of Material Science and Technology of Slovak University of Technology. Research proved the effectiveness of proposed new teaching model with emphasis on creativity improvement and ICT support. With the use of the proposed new teaching model, the study results were improved with statistically significance. Research showed us the need for searching of new education methods that developing not only students´ cognitive abilities but their creativity, as well. Creative person with high flexibility in thinking may reach better and more original results than person with full information support, which is not able to flexible work with information at disposal. The students´ attitude towards study courses is improved by application of creative methods.

At present the research continues in the form of project planned for two years with title „ Implementation of internal quality assurance system of education". Project is granted from Structural fund of EU. The goal of this project is to develop and verify system of objective appraisal of quality, efficiency and usefulness of education in bachelor study programs at Faculty of Material Science of University of Technology.

Acknowledgement: This research and results publication was supported by KEGA grant no. 1742.

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FAA'S SAFETY PLAN *DESTINATION 2025;* STUDIES IDENTIFY A NEED FOR AN AIRPORT DRIVER TRAINING EDUCATION STRATEGY AND METRIC

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ABSTRACT

In a dissertation study completed by Rankin in 2007, a review of literature examined training effectiveness from several aspects. Efforts by the FAA to date have focused primarily on air traffic controllers and airline pilots, although 20% of the annual accidents at the 35 largest U.S. airports involve airport vehicles deviations. In a 1994 study Rankin identified training of ground vehicle operators as the most effective FAA initiative to reduce runway incursions, however, ground vehicle operator training is still conspicuously absent from mention in most literature; even though vehicle operators traverse airport movement areas on a daily basis. In a previous study conducted by Rankin in 1994, runway driver training was included as a major objective identified by the FAA to reduce runway incursions, and ranked the most effective objective by the aviation industry in Rankin's 1994 study. Airport movement area driver training is no longer a specific objective, strategy, or metric in FAA's most recent safety plan titled *Destination 2025*. In another study conducted by Rankin in 2008, the industry was asked "should airport driver training be included as an FAA objective, strategy or metric? – Seventeen participants (89.5%) responded yes, while two (10.5%) responded no. As evidence by three studies conducted by Rankin in 1994, 2007, and 2008, the FAA's most recent *Destination 2025* strategies and metrics continues to exclude airport driver training within the plan's safety vision through the year 2025, and it still remains conspicuously absent from mention. As a result, this paper identifies the continuing need for an Airport Driver Training Education initiative, strategy, or metric in FAA's most recent safety plan.

Keywords: Driver Training, Runway Incursions, Runway Safety, Vehicle Operator Training, Airport Safety, FAA Safety Plan, Airport Driver Education

INTRODUCTION: 2007 STUDY

In a dissertation study completed by Rankin in 2007, a review of literature examined training effectiveness from several aspects. A review of literature on the *Runway Safety Blueprint 2002-2004* addressed the primary causes for runway incursions and the complexities involved in solving runway incursions. A review of literature on distance education and computer-based interactive training addressed knowledge gained by other researchers on traditional versus computer-based training, and the skills transfer capabilities of the various methods of training. Finally, a review of literature on Kirkpatrick's model addressed the four *aspects of training* in Kirkpatrick's model

with respect to training effectiveness. These aspects include:

1. Reactions -- What trainees' say about the value of the training.
2. Learning -- Objectives met, knowledge and skills learned.
3. Behavior -- The skills acquired are implemented on-the-job.
4. Results -- Impacts on job performance

As a result of the review of literature, Kirkpatrick's model was identified as the model most appropriate to use for the development of a model for the study of airport driver training methods at the largest U.S. towered airports.

Runway incursions are divided into three classification types. These types include pilot deviations, operational deviations, and vehicle deviations. In the United States, pilot deviations account for approximately 57% of the total runway incursions, operational deviations account for 23%, and vehicle deviations account for 20% . After type, runway incursions are further stratified into four distinct categories by increasing severity, ranging from category D, the least severe, to category A, the most severe.

METHODOLOGY AND FINDINGS OF THE 2007 STUDY

This study examined runway incursions at the 35 largest U.S. towered airports. This study focused only on the runway incursion problem caused by vehicle deviations, which is under the purview of airport operators. This research was intended to be primarily a descriptive and correlational (non experimental) analysis of the relationships that exist, if any, between the methods used for airport driver training and the number of runway incursions at the 35 largest U.S. towered airports.

Statistical analyses on runway incursion data were used to address the research question: Does a relationship exist between the methods used for airport movement area driver training and the number of runway incursions for any class of runway incursions at the 35 largest U.S. towered airports?

MANOVA identified the independent variable, *method of training*, as statistically significant at the 0.000 level. Pairwise comparisons in MANOVA identified traditional airport movement area drive training as statistically different from interactive computer-based airport movement area driver training at a statistically significant level of 0.000 for runway incursion categories A through C. The only exception, in the pairwise comparisons test, was category D runway incursions, which were not statistically significant at the 0.418 level. Finally, estimated marginal means values for runway incursion categories A through D supported the finding that those airports using AAAE interactive computer-based airport movement area driver training have the propensity for fewer runway incursions caused by vehicle deviations for all categories of incursions.

As a result, MANOVA analyses supported the alternative hypothesis that there is a relationship between the methods used for airport movement area driver training and the number of runway incursions for any class of incursions, with the exception of category D incursions.

Structured equation modeling (SEM) showed the linear relationships that existed between the variables. There were four aspects (latent variables) of training associated with the training methods. They

included (a) aspect 1- learning objectives met, (b) aspect 2 – knowledge increase, (c) aspect 3 – on-the-job confidence, and (d) aspect 4 - effectiveness of materials and methods.

The effect or variance caused by aspects 1 through 4 on the runway incursion variables was identified as .06 in the SEM. Therefore, aspects 1 through 4 accounted for 6% of the variation in runway incursions for categories A through D. As a result, SEM analysis supported the alternative hypothesis that there is a relationship between the methods used for airport movement area driver training and the number of runway incursions.

Although 6% of the total variation may appear small, airport movement area driver training is only one of many initiatives that must be properly implemented to effectively reduce vehicle deviations at the 35 largest US airports.

SUMMARY AND RECOMMENDATIONS OF THE 2007 STUDY

As a result, statistical analyses supported the hypothesis that there was a relationship between the methods used for airport movement area driver training and the number of runway incursions. Other than the publication of FAA Advisory Circular 150/5210-20 on airport vehicle surface operations, airport movement area driver training method is not specifically addressed in the 40 runway incursion prevention initiatives outlined in the *FAA Runway Safety Blueprint 2002-2004*. Efforts by the FAA to date have focused primarily on air traffic controllers and airline pilots, although 20% of the annual accidents at the 35 largest U.S. airports involve airport vehicles deviations.

Most U.S. airports use traditional airport driver training. The data from this study suggested that for those airports using traditional airport movement area driver training, the propensity for the number of runway incursion accidents is more likely than at those airports that are using computer-based airport movement area driver training. This implies that the propensity for runway incursions due to vehicle deviations is higher overall in the U.S. than would be the case if the interactive computer-based airport movement area driver training method was implemented at all the 35 largest U.S. airports. These finding are inconsistent with the generally accepted thinking within the airport industry that both methods of airport movement area driver training are equally as likely to reduce runway incursions.

Since the data suggested that there is potential to reduce runway incursions by replacing one driver training method with another, the potential exist to reduce airport liability exposure at all U. S. airports. Other benefits may include a reduction in property damage, and an overall lowering of airport liability insurance cost to airport owners.

Runway incursion data from the *FAA Runway Safety Report 2004* indicated that for the 18 airport driver training officials that participated in this study, their airports reported 216 runway incursions over the study period -- an average of more than four runway incursions per airport per year. Each incursion having the potential for loss of life and property damage.

Accordingly, it was recommended that the Federal Aviation Administration should mandate that all the 35 largest U.S. airports acquire and implement the AAAE or similar interactive computer-based airport movement area driver training system over

the next two-to-three year timeframe, or as quickly as the systems can be acquired and installed. This initiative should be added to the *FAA Runway Safety Blueprint 2002-2004* and implemented through an amendment of Federal Aviation Regulation Part 139.

One explanation for the lack of training effectiveness of both methods of airport movement area driver training may be similar in nature to motorist failing to observe proper and lawful automobile traffic controls such as speed limits, stop signs, and traffic lights, etc. Although the vast majority of the driving public operates in a safe and proper manner, a small percentage fails (by choice, ignorance, or inattention) to observe the rules of the road.

Study, education, and strict enforcement are the tools currently being used by airport operators to address the problem of vehicle deviations. This system of addressing vehicle deviations is sometimes called *study, educates, enforces* (SEE) and has been successful in many areas, not just aviation.

THE 1994 AND 2008 STUDIES

In a 1994 study Rankin identified training of ground vehicle operators as the most effective FAA initiative to reduce runway incursions, however, ground vehicle operator training continues to be conspicuously absent from mention in most literature; even though vehicle operators traverse airport movement areas on a daily basis. In the 2007 study Rankin also suggested that the current runway safety initiatives contained in the *FAA Runway Safety Blueprint 2002-2004, should be* evaluated and ranked in the order of their effectiveness by a survey of industry officials.

As a result, Rankin completed a similar study in 2008 that investigated the continued perception of industry officials as to the effectiveness of the FAA initiatives contained in the *FAA Runway Safety Blueprint 2002-2004*. The 1994 and 1998 studies were compared to see if there was a similarity of the perceived effectiveness by industry officials of the FAA initiatives or objectives. Since airport driver training was ranked as the number one initiate in the 1994 study and is not included in the FAA *Runway Safety Blueprint 2002-2004*, the 2008 study asked industry officials if airport driver training should, or should not be included in the *FAA Safety Blueprint.*

METHODOLOGY AND FINDINGS OF THE 1994 AND 2008 STUDIES

For the 2008 study descriptive statistics was used to rank the five most effective and five least effective objectives outlined in the *FAA Runway Safety Blueprint 2002-2004* and compared them to the five most and least effective initiatives in the FAA's *Runway Incursion Plan* of the 1994 study to determine what disparities, if any, were apparent. Both survey instruments were prepared and mailed out to all participants with a prepaid postage return envelope. Data collection from the latest
survey was completed in the Spring of 2008.

In the 1994 each participant was asked to rate the degree of effectiveness that each initiative in the *FAA's Runway Incursion Plan* has or will have on reducing the number of runway incursions using a five point Likert-type survey instrument with a scale of 0 (the least effective) to 5 (the most effective). A 96% response rate was achieved in the 1994 study. The same type of survey instrument was used to collect data for the 2008 study. Nineteen of the 54 participants surveyed in the 2008 study

responded achieving a 35% response rate. The mean for each initiative or objective was then determined using SPSS © software, which is the quotient of the sum of the values for each initiative or objective divided by the number of responses received for each initiative or objective. A comparison of the effectiveness of each initiative or objective was then determined by ranking each initiative or objective by its mean to establish the five most effective and the five least effective initiatives or objectives for both the 1994 and 2008 surveys.

In the 1994 survey the five most effective initiatives were identified by industry officials as: (a) Training of Ground Vehicle Operators with a mean value of 4.42; (b) Airport Surface Detection Equipment with a mean value of 4.30; (c) Stop Bar Lighting with a mean value of 4.23; (d) Airport Surface Traffic Automation with a mean value of 4.18; and (e) Airport Movement Area Safety System with a mean value of 4.00.

In the 1994 survey the five least effective initiatives were identified by industry officials as: (a) New Runway Safety Database with a mean value of 2.25; (b) Airport Technology Conference with a mean value of 1.92; (c) Audiotape on Runway Incursions with a mean value of 1.76; (d) Ground Movement Safety Awareness Products with a mean value of 1.75; and (e) New Computerized Database for Aircraft Performance with a mean value of 1.51.

In the 2008 survey the five most effective objectives were identified by industry officials as: (a) **–** Evaluate, and if appropriate, implement national procedures that require read backs of any clearance to enter a specific runway, hold short of a specific runway, or taxi into position and hold instructions with a mean value of 4.61; (b) Develop and evaluate a visual signal that provides direct warning to flight crews on final approach when the runway is occupied with a mean vale of 4.50; (c) Publish guidance on standard surface operations phraseology guidance for pilots and mechanics moving aircraft with a mean value of 4.44; (d) Assess selected Air Traffic procedures in terms of enhanced runway safety and recommend actions to retain, modify, or eliminate as appropriate with a mean value of 4.39; and (e) Improve runway safety data collection, storage, retrieval and distribution. Data and information useful for improving runway safety is contained in multiple data bases operated by different organizations with a mean value of 4.33.

In the 2008 survey the five least effective objectives were identified by industry officials as: (a) Create and accomplish a regional runway safety plan for each FAA region (every 18 to 36 months) tailored to specific operational and geographical needs with a mean value of 3.78; (b) Improve the collection and analysis of operational error data by supporting the implementation and dissemination of the JANUS tool throughout the air traffic control environment with a mean value of 3.72; (c) Maintain the published AMASS deployment waterfall schedule with a mean value of 3.61; (d) Complete over 1,000 safety seminars per year incorporating runway safety, RIIEP, surface movement Advisory Circulars and marking, signage and lighting as seminar themes with mean value of 3.56; and (e) Expand the role of Flight Service Station Specialists to provide runway safety information for towered and non-towered airports with mean value of 3.44.

In response to the question - *In a 1994 survey on FAA objectives, airport movement area driver training ranked the most effective objective. Airport movement area*

driver training is no longer a specific objective. Should it be included as an FAA objective? – Seventeen participants (89.5%) responded *yes,* while two (10.5%) responded *no.*

CONCLUSIONS AND RECOMMENDATIONS

The 1994, 2007, and 2008 studies support the proposition that training and education of airport drivers is a key safety factor in reducing the number of runway incursion accidents, and should be included in the FAA's most recent safety plan titled *Destination 2025* as a key safety strategy and metric. The results of the 1994 and 2008 studies support the 2007 dissertation study that the Federal Aviation Administration should mandate that all the 35 largest U.S. airports acquire and implement interactive computer-based airport movement area driver training system as quickly as the systems can be acquired and installed. This educational initiative should be added to the current FAA *Destination 2025* safety plan and implemented through an amendment of Federal Aviation Regulation Part 139. To date (Spring of 2012), no action in regard to these published studies or their recommendations has been effective in persuading the FAA to take action on implementing interactive computer-based airport movement area driver training and education at the 35 largest U.S. airports, nor has any amendment of Federal Aviation Regulation Part 139 been considered. Finally, it is recommended that FAA's *Destination 2025* safety plan be amended to address airport driver training as a major strategy and metric.

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An Application of Benchmarking and Root Cause Analysis of the Co-Education Model

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ABSTRACT

In this paper application, success or failure of a novel model of distance education, Co-Education model in Sakarya University Department of Industrial Engineering is discussed. A brief literature about distance education models which assumes insignificant difference between formal education and distance education were abstracted. Than a couple of statistical tests including formal and Co-Education students' scores and a survey were conducted to investigate any difference in both models. Benchmarking results showed that there is a relativistic failure of Co-Education model according to students' exact same lectures' exam scores. Main reasons and sub reasons for this failure are analyzed with Ishikawa Diagram which is a special technique of Root Cause Analysis. 4 main Reasons and 10 sub reasons are extracted via Ishikawa diagram. Finally the results were discussed.

Keywords: Co-Education, Root Cause Analysis, Distance Education, Benchmarking of educational models

1. INTRODUCTION

With the advent of multimedia and information technologies, popularity and importance of distance education have been increasing rapidly. Today, many universities around the world give distance education services.

The first distance education system swings into action in Turkey with Dewey's report which is about "training and treatment of teachers" in 1924. First implementation of distance education starts with using letter for communication in 1950's [1]. Distance education progress is followed by the establishment of Open Education Faculty in Anadolu University in 1982. Today, distance education level is conducting with 2-year associate degree programs, undergraduate and internet supported formal education graduate programs (Co-Education programs).

Distance education applications in Sakarya University (SAU) began with the opening of the Adapazarı Vocational College in 2002 and these applications have been progressing with establishment of eMBA (distance Master of Business Administration) program in Graduate School of Social Science since 2003. Final exams of distance education has been carried out in the facilities of Sakarya University, all other activities are conducting via internet by LMS (Learning Management System) [2]. The first implementation of Co-Education in higher education system had been started in fall semester of 2008. Initially, Co-Education in Sakarya University began with the departments of Industrial Engineering (IE), Computer Science and Human Resource Management. After 2010, with the established of the other programs in different fields the number of departments reached to nine.

Co-Education is a combination of the conventional education techniques and the synchronous and asynchronous lecture approach in conjunction with the face to face training in distance education by using technology support. Co-Education splits by 30% of formal education which is carried out in Friday and Saturday and 70% of distance education which is carried out on the other week days.

Co-Education students reach the distance education portal via SAULMS (Sakarya University Learning Management System). In this portal, a student can reach weekly lecture materials, lecture videos and other staff with the same username and password information which is in the University Student Information Database. Also he/she can download these documents to his/her computer and the system provides students an asynchronous study opportunity.

In this paper, we compared conventional formal education model that already have been applied and the Co-Education Model which has been executed a few years ago, by the means of students' success rates and a student survey to evaluate professors performance. The survey outcomes are statistically analyzed and a significant difference between formal education and Co-Education is observed. We investigated root causes of success or failure of Co-Education Model in SAU IE.

2. LITERATURE REVIEW

Keegan (1986) mentioned the following properties related to distance education; first teachers and students are separated during the learning process and second distance education students consider themselves alone because of not being physically in the classroom and third student and teachers use video and other similar technological devices [3]. Mitchell and Honore (2007) describe the Co-Education as an education model which includes face to face interaction in classroom and online communication via computer [4].

In the World first distance education studies started with "Steno Lessons" in a newspaper in 1728. The British Open University, starting with newspaper and established in 1960s in England [5]. In Turkey initial application was performed in academic year of 1958-59 by surveying Institution of Banking and Law of Commerce, bound to the Law Faculty in Ankara University [6].

In 1981, commissioned to universities to grant distance education and then this mission was given to Anadolu University by means of law, counted 41, made in 1982 [7]. In following years it is seen that not only Anadolu University but also other universities grant distance education. After the base of Internet was formed in 1993 in Turkey, distance education based on Internet began with the leader of Middle East Technical University in 1997 [8]. Nowadays Ankara University, Sakarya University, and Mersin University have background for not only to grant distance education by granting certificates but also to grant university degree in distance.

Kleinman and Entin (2002) made a comparison between the students who take their computer science lecture in the classroom and via internet in their study [9]. This study shows that there is no difference in student learning outcomes between online course and conventional course students. Rivera and Rice (2002) made a comparison between three class formats (conventional, web base and Co-Education) [10]. In this study, the performance of the students measured by exam scores and this study points out that there is no significant difference between those three formats. Işık and Güler (2011) made a comparison between conventional and distance education master programs via survey and oral interviews. Outputs of this study indicate that students prefer distance education because of time and work permission problems [11].

The quality of the academic experience and intensity of the high school curriculum affect almost every dimension of success in postsecondary education. Indeed, those students who are best prepared coming out of high school are best positioned to do well in college, regardless of who they are, how much money they have, or where they go [12].

3. BENCHMARKING OF FORMAL EDUCATION AND CO-EDUCATION MODELS

In this part of study we investigated the performance of education models in 2 aspects, student basis and faculty basis. We performed a couple of statistical analyze to measure students' success. And a survey was conducted to figure out professors' performance.

Students' statistical analysis

In Sakarya University, every student including Co-Education and conventional formal education has the right to obtain same diploma. Therefore Co-Education students and conventional education students have same lecture contents. Co-Education models relativistic success or failure is measured by Co-Education students' exam scores. And this is compared with conventional formal education students' exam scores. The measurements are based on the performances of these two types of students' exam scores on the common professors' lectures to sustain a better evaluation (Success rate= Number of students who passed the course successfully/ Number of all students who take the course).

The success values were applied to normality test and the edge values of formal education excluded from evaluation. The success values which fit to normal distribution (sig.=0.200) indicate that two types of students has different success rates (for group statistics, formal education student are more successful than Co-Education students).

Survey for Evaluating Professors

Evaluation of professors by students is one of the most common and effective methods that perform the success of an educational institution at the university level [13]. In SAU, students fill out the survey about the course which is taken by them in relevant semester, professors and the outputs of IE program at the end of each semester. At this stage, all answers which was belong to each course in the academic year 2010-2011, had analyzed to assess the difference between Co-Education and formal education.

32 courses conducted by the same faculty member at Co-Education and formal education programs. Therefore, 711 students' responses at these courses were used in the analysis of the mentioned survey.

In the statistical evaluation, all data has been found to comply with the normal distribution. Accordingly, the hypotheses which were generated for analyzing with independent-sample t test.

· H_0: "The averages of formal education and Co-Education evaluation scores are equal (There is not a significant difference between them)
· H_1: "The averages of formal and Co-Education evaluation scores are not equal (There is a significant difference between them)

Levene's test shows that the group's variance of formal education model and Co-Education model are not equal with 95% confidence. (Mean difference is 0, 56 and Std Error Difference is 0, 137). Difference of professors' evaluation between those models (approximately 0, 5646 points) is statistically significant (P=0, 000). Faculty performance analysis resulted in a lower score by students in Formal Education than others.

4. ROOT CAUSE ANALYSIS OF SUCCESS OR FAILURE OF CO-EDUCATION MODEL IN SAU IE

Root cause analysis (RCA) is a class of problem solving methods aimed at identifying the root causes of problems or events. We used Ishikawa diagram which is one of the most common Root cause analysis techniques to determine the sources of relativistic failure of Co-Education model according to formal education model.

We used brain storm technique to determine the possible candidate reasons of relativistic failure. Then a team which consists of professors voted the candidate reasons. After this phase the reasons were sorted by degree of importance. Reasons with weak relations and reasons which are less relevant were pruned. Furthermore main reasons, sub reasons were displayed. Briefly, the main reasons are; Time Management, Past Educational Habits, Lack of Motivation, Less-Scored Students in University Qualification Exam. A detailed Ishikawa diagram is shown in Figure I.

5. CONCLUSION

The results of this study show that, on the contrary to researched literature there is a significant difference in formal education and Co-Education on the aspects of students' performance criteria. Students of Co-Education have noticeably lower scores compared to students of formal education on the exact same exams of same courses. The main reasons and sub-reasons for this relativistic failure have been determined with Ishikawa diagram which is a technique of Root Cause Analysis. Ishikawa diagram of this relativistic failure points out that there are both student basis problems and faculty based problems. Student basis problems are such as time management and less-scored students in university qualification exam and faculty based problems are such as inadequate support of time management for students and less effort for students' motivations.

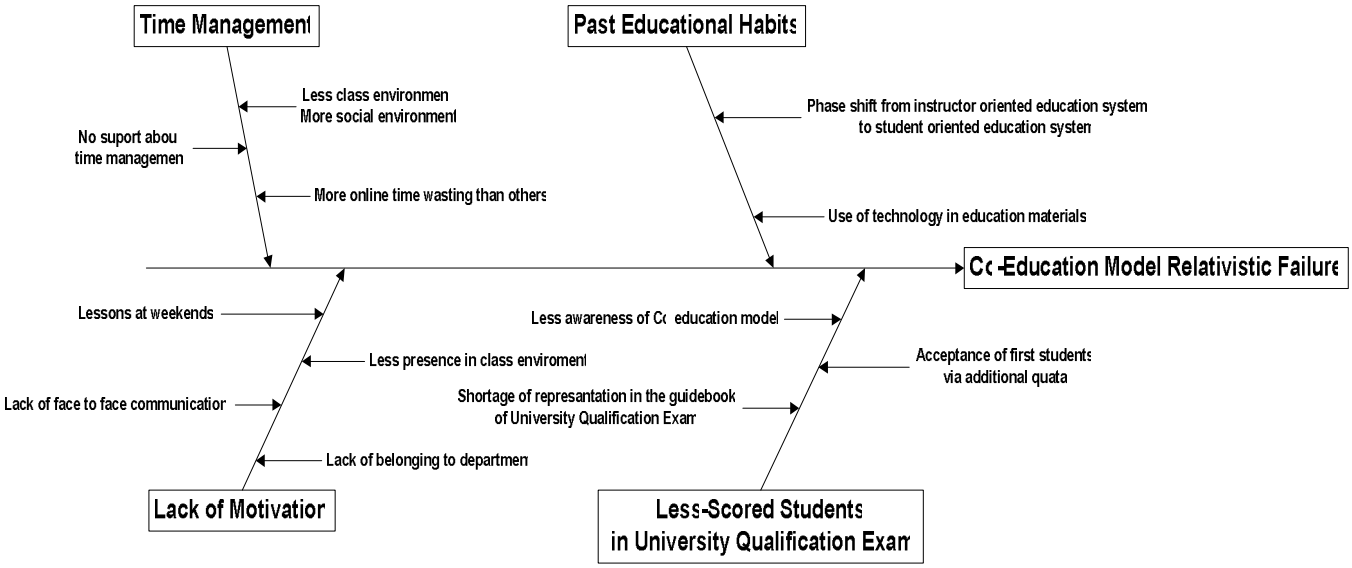

Figure I. Ishikawa diagram of Co-Education Model's Relativistic Failure

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Web 2.0 As A Pedagogical Strategy In The Process Of English Language Teaching - Learning[1]

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ABSTRACT

Traditionally, multimedia systems have been used in teaching English, but the introduction of Information and Communication Technology, or ICT, in a "massive" way has provided the teachers with a powerful tool to motivate students. However, this has become an issue in schools of the state due to the absence of concepts and methods.

In short, it is stated that the advance was obtained when Information and Communication Technology was suddenly introduced into the educational system, so this proposal was emphasized only in Web 2.0 specifically developing the work platform of the Inglés y Virtualidad program at the Universidad National Distance Education University Florida with YouTube and blogs as educational tools.

This paper describes the results of a research project that shows how to integrate Web 2.0 technologies into the teaching of English in order to contribute to the formation of updated, collaborative and creative instructors. Hence, what is truly relevant in the process is to get teachers to make pedagogical use of new technologies.

Keywords: Didactics of English, teacher, elementary education, B-Learning and Web 2.0 technologies.

1. INTRODUCTION

Since long ago the speed in which knowledge has multiplied is widely known, as well as its transformation into information and the need to have it quickly available to streamline processes. This aforementioned fact requires the inclusion of strategies and tools provided by new technologies which are applied to education.

Given this situation, there exists the priority of developing competency among teachers in this particular subject, all of whom are expected to develop the ability to utilize ICT in teaching a second language and helping students to act as citizens of a modern and multicultural society.

The importance of this project is to create a methodological proposal for incorporating Web 2.0 technologies into the teaching and learning of English at the Escuela Normal Superior Bucaramanaga, and it must begin with teacher training. To better illustrate the purpose, collaborative learning activities 2.0 are built to yield a product consisting of a specific Methodology Guide, where English teachers can draw out different possibilities of working with ICT.

2. WEB 2.0

Generalities: With the passing of time, these technologies have evolved and have become what we now know as Web 2.0 tools. This term was first used by Dale Dougherty and Craig Cline, and subsequently by Tim O'Reilly in 2004, who defined it as the second generation in developing and designing websites. Web 2.0 facilitates communication, exchange of information under safe parameters, and the inter-operability and collaboration among users, thus making them active cooperators of the website.

Web 2.0 and Education: The sites under a Web 2.0 design are dynamic for they not only offer information hosting for users but also make use of multiple applications. These make Web 2.0 design ideal for creating information in collaboration with others, organizing social networks, sharing videos and photos, and creating wikis, blogs, podcasts, and folksonomies, among other benefits.

There is no doubt that the design of Web 2.0 tools is becoming more and more useful these days, and that it can also be applied in the use of teaching English as a versatile and varied process. With an impressive speed, Web 2.0 tools make it possible for learners to use Web services offered by some providers, which is actually an endless array of free tools and applications of the network that teachers should take advantage of. When these tools are combined with each other, some of them become popularly known as wikis, blogging, micro blogging sites, social markers or tags (social bookmarking) and spaces for storing and sharing videos, photos, audio, images, PowerPoint presentations, documents, spreadsheets, maps, RSS, and so on. In fact, it is difficult to establish which of them are in greater demand, use or importance, as they all offer a wide array of information and communication options, and they all are potentially useful. However, this time, blogs and YouTube served as support in order to implement these tools.

Integration of ICT in teaching practice: The Department of Education in Victoria, Australia (1998) proposes three stages in which the teacher passes the integration of ICT: The first stage is the exploration of new possibilities that technologies offer for learning, developing new skills and understanding the role that ICT can play in the classroom. The second is the development of personal skills and the incorporation of ICT in teaching, as well as developing classroom practices that integrate learning technologies. The third is concerned with the development of advanced skills, the formulation of innovative ways to use class technology, and the sharing of knowledge and skills with others.

Therefore, the use of new technologies is not an isolated phenomenon, but an allied activity in carrying out the ultimate goals of educational institutions.

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1. Project Investigation result, Methodological Proposal to incorporate Web 2.0 technologies into teaching-learning process of English at Escuela Normal Superior in the city of Bucaramanga with the teacher's perspective. 2009 – 2011. Director PhD Eduardo Carrillo Zambrano.
2. olga.contreras@campusucc.edu.co Magister in E-Learning. Research Professor at Universidad Cooperativa de Colombia.

3. METHODOLOGY

The crystallization of the proposal was made possible through both a quantitative and a qualitative approach. From the quantitative cut, the study was the descriptive or survey type which was used in collecting the necessary information through the use of a questionnaire for the teachers. The method of data collection was basically the survey, so that the data obtained were analyzed through descriptive The design of the research project was conducted from the research - Action with collaborative approach, which consists of a research process focused on understanding a specific phenomenon within its real life context, and this process usually involves multiple sources of information (Grinnell, 1997). In this regard, what is ideal is the research perspective that focuses its interest on analyzing and controlling how changes is produced in educational practices after using the Methodological Guide for assistance. This research process is promoted by the subjects themselves and then referred to action research, whose task is shared by groups of teachers, students, parents and staff.

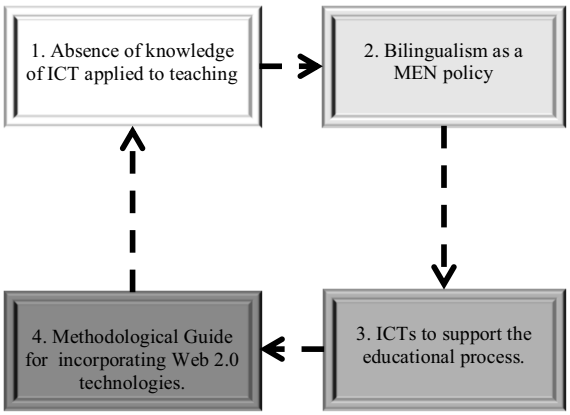

Figure No.1. Formative stage

The proposed training stage (Fig. No. 1) takes its cue from the teachers' lack of knowledge on Information Technology and Communication. In turn, the Ministry of Education is implementing the Colombia Bilingual program by 2019. This will definitely involve major changes in the course of English through the inclusion of ICT guidelines. This then became the ultimate bases for the construction of this methodological guide.

In this case, it was necessary to create a methodological proposal for incorporating Web 2.0 technologies into the process of English teaching by those who must take an active and collaborative role in the classroom and at the same time. It was continually thought that the effectiveness of the proposal depended on the analysis of the following phases:

Appropriation of the population and the scenario: Four virtual mentor teachers were selected and trained by the National Distance Education University. The Students finished the online English course at A1, A2 and B1. The virtual classroom was transformed with the upgrading and acquisition of more equipment.

Qualitative data collection: A survey of English teachers was conducted among institutions of the state as a data collection instrument.

Construction and application of the Methodological Guide for the generalization of the proposal: At this stage a methodological guide was designed from the perspective of the teacher. The objectives laid out the guidelines to generate this product. A blog and YouTube served to revitalize the tools for developing Web 2.0 collaborative activities.

Observation and Analysis of the Methodological Guide*:* The students' performances were recorded in the online course and collaborative activities. External experts validated the Guide.

4. POPULATION

The Escuela Normal Superior Bucaramanga, which is an institution of the state, and supported by the National Distance Education University, Florida, organized a "Inglés y Virtualidad Program," which sought to train students in levels A1, A2 and B1. The duration of this training was a period of three years from 2009 to 2011.

The pilot test began with 400 students from eighth grade in 2009, of which 385 remained in ninth grade and 340 students finished the tenth grade in 2011.

Regarding the teachers' participation, the population was formed by four tutors who assumed the role of virtual teachers after an appropriated selection process and training.
In addition to the aforementioned population, a support staff for the control and management of the virtual room was also included.

5. RESULTS AND ANALYSIS

The results obtained are described using three perspectives: the student's, the tutors' and the institution's, where the use of the tools played an important role in the creation of collaborative activities. However, much more important that these, is how the pilot study integrated the Web 2.0 into the teaching of English and this was recorded in the methodological guide for teachers.

The students were highly motivated with the new training for English, the implementation of new strategies, and the development of virtual collaborative tasks in the virtual platform. In fact, at the end of 2011, 360 tenth grade students completed the course online at the B1 level according to the reference of the Common European Framework. The course included the components of Reading, Listening comprehension, Vocabulary, Grammar, Speaking, Pronunciation and Phonetics, and Writing.

Furthermore, the virtual tutors could get familiar with and thus, get trained in new types of technology through the application of the Methodological Guide. In this sense, there was significant progress in different aspects such as in the facilitation of communication among institutional participants, access to a large amount of specialized and updated information, change of the teachers' role, enhancement of collaborative work, and strengthening of intercultural education.

The transformation of two-class scenarios was achieved in the institution. One of these scenarios uses electronic technology resources (TV, DVD, and VCR) for teaching at classrooms, and the other uses a virtual classroom (30 computers, wireless, air conditioning, adequate lighting and smart board). All these help facilitate the development of new working methods in the classroom as parameters shared in the Guide. In fact, both of these scenarios have a great potential for educational use in supporting the teacher's explanations as well as complementing their personal materials, their exposure to student digital work, and their material recovery of the explanations, exhibitions and activities.

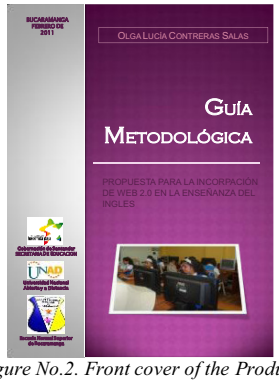

Figure No.2. Front cover of the Product.

On the whole, the investigation helped to build knowledge around the implementation of the B-Learning type, based on the experience of the Virtual program. This brought about a different dynamic on teachers, and with this, the Methodological Guide was developed and implemented as the end product (Figure # 2) from the perspective of the teacher. The purpose of the development of the Methodological Guide was to encourage the use of Web 2.0, with the results to highlight that include interactivity, accessibility, and information feedback. The last one allows the teacher - tutor to identify and control the situation if the student responds to the approach outlined in collaborative activities such as YouTube and blogs.

6. CONCLUSIONS

The inclusion of Information Technology and Communication in English language teaching changed the dynamics of classroom teaching into virtual learning for about 50%, where students manage time asynchronously, and where participatory and collaborative work becomes necessary to perform activities.

The student eagerly assumes b-learning modality because of being an active user of new technologies, and therefore, the student becomes the principal character of the teaching-learning process with the teacher as a mediator between ICT and the second language.

In the real panorama, the educators must gain space in the use of new technologies to achieve a match among students' knowledge in order to produce a productive and motivating effect in the end.

To conclude, the following question emerges: Are today's teachers really prepared to guide the learning of the generations of the XXI century?

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Mathematical Competencies in Primary School: Effective Approaches of Teaching and Leadership in Heterogeneous Classrooms

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ABSTRACT

This contribution presents the German results of the first measurement of the European Collaborative Research Project (ECRP) ADDITION, which consists of 6 European countries. ADDITION (A Dynamic Effective Knowledge Base for Quality in Education) was selected to be supported by the European Science Foundation (ESF) out of a review against 27 European competitors. The overall project objective is to research the influence of system level aspects (e.g. decisions of educational policy) on the school- and class level and on students' math and science achievement. Furthermore the objectives of the German project also focus on the influence of school and classroom level aspects on students' math and science achievement.

One of the main research questions in this study was to identify certain concepts, strategies and methods of teaching and in school, which contribute to a better acquirement of mathematical competencies of students with a disadvantaged socioeconomic background and with migration background. Scales on Professional Learning Communities were new constructed in this context to analyze their effect on this issue.

Keywords: Math Achievement, Social Disparities, Primary Pupils, TIMSS Survey, Factor Analysis, Professional Learning Communities.

1. INTRODUCTION

Already after the first measurement of the Progress in International Reading Literacy Study (PIRLS) it became obvious, that Germany is one of the countries with the strongest connection between the pupils' social background and their reading achievement [1, 2].

Taking into account the trend perspective and comparing the PIRLS 2001 results with the findings of the new PIRLS 2006 survey the connection between the pupils' social background and their reading achievement has changed not significantly [3]. Pupils with a low social background still have a deficit in reading competency of 40 points. In practice that means that those pupils have a deficit in their reading achievement of one school year!

That means that especially pupils with a low social background need a better support in school but of course also from their families. The results of the analyses from Klieme, Neubrand and Luedtke [4] with the German PISA 2000 data emphasize that. They found out that the connection between the social background of the pupils and their math achievement is negligible if their reading achievement is controlled. So reading achievement is an important key competence.

2. OBJECTIVES

This contribution presents the outcomes of analysis in the context of the European Collaborative Research Project (ECRP) ADDITION. One of the main research questions in this study was to identify certain concepts, strategies and methods of teaching and in school, which contribute to a better acquirement of mathematical competencies of students with a disadvantaged socioeconomic background and with migration background. As it is evidenced in the

empirical educational research in Germany and in Europe especially students with that kind of socio-economic background run a high risk to suffer from educational inequality [5, 6]. The objective in this context was to construct scales on Professional Learning Communities to analyze their effect on educational inequality.

3. THEORETICAL FRAMEWORK

The dynamic model of educational effectiveness [7] has been used as a starting point and as a theoretical framework for the analyses. The model is based on three dimensions of school quality: Inputs (system preconditions, system and regional steering), processes (education on school and classroom level) and outputs (quality of student achievements, attitudes and behaviors) [8]. Also the SES of the pupils as an individual precondition is included in the model of Creemers and Kyriakides.

4. METHODS

The European Collaborative Research Project includes a longitudinal design and measures mathematics and science achievement with a standardized test, based on test items used by TIMSS 2007. Data on individual, class and school level are collected by using standardized questionnaires. Achievement tests and questionnaires were administered on two points of measurements, at the beginning and at the end of grade 4, in 54 randomized selected primary schools. The samples include approx. 1.500 students, 1.200 teachers and 54 headmasters. As a main research approach factor analyses were conducted.

5. RESULTS

As a result of the analyses certain scales on Professional Learning Communities could be identified that were a basis for further in-depth analyzes to outline their effect in the context of fostering the mathematics competence of students with a disadvantaged socioeconomic background and with migration background. The results indicate that the new constructed scales on Professional Learning Communities work well. Their Cronbachs Alpha varies between .71 and .87.

This contribution indicates that it is important to implement information on Professional Learning Communities when conducting related studies and analyzes, beyond information on cooperation or teamwork that are used in most studies so far.

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Cyberbullying and Cyberbullies: Implications For K-12 School Administrators

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ABSTRACT

The purpose of this research study is to collect data regarding the types of cyberbullying present today in K-12 schools, the effects of cyberbullying, and those who tend to serve as cyberbullies. This data will be used to make recommendations for school administrators pertaining to strategies that may result in the abatement of this phenomenon. The study will take place at a university located in the southern region of the United States. Participants will be college students describing their high school experiences.

Keywords: Principals, Cyberbullying, Internet Use, Leadership

INTRODUCTION

The advantages and uses of web 2.0 tools have not only been realized by US students, but by individuals throughout the world. Users of web 2.0 tools encompass a global society with individuals from all ages, ethnic groups, and nationalities joining together to participate, collaborate and engage in this interactive technological environment. Web 2.0 was first introduced to society by Tim O'Reilly [1] but was later defined with John Battelle [2] as tools and technologies "all about harnessing collective intelligence" (p. 4). Many individuals utilize Web 2.0 tools today that include technologies such as social networking sites (e.g. Facebook or MySpace); wikis (e.g. Wikipedia or WikiSpaces); and blogs (e.g. Blogger.com or Wordpress.com). As Internet accessibility has become widespread throughout the United States and the numbers of individuals have computers and mobile devices has increased, the popularity of Web 2.0 tools has exploded and continues to remain highly popular especially amongst teens and children. In a report published by Cox Communications [3] regarding technology use of teens, 72% of teens (ages 13-17) were found to have a personal profile on a social network site. This represented an increase in usage up from 71% in 2007, and 61% in 2006. This critical information provides a better understanding of the level of comfort children have with the use of technology and indicates that students are using Web 2.0 tools outside of the educational environment. Because of the rapid increase in the use of these technologies by students as well as the eagerness of educators to utilize these often free tools within the classroom, school administrators and teachers should understand the emotional and physical implications surrounding Web 2.0 and other use of technologies, most notably the implications of cyberbullying.

THEORETICAL FRAMEWORK

Albert Bandua [4] is credited for the development of social learning theory that postulates an individual can learn a specific behavior simply by observing others demonstrating that behavior. Students, particularly at young ages, are highly influential. In fact, many social clicks or social networks start developing at early ages. Social learning theory asserts that individuals learn behavior through modeling what they see in their environment. So, for example, if the leader of the social click was making fun of a particular individual, many of the followers of that group might be more inclined to participate in this type of behavior because it is the social norm for the group.

This behavior, like most traditional problems, can also occur in web-based settings such social network sites. The use of web 2.0 technologies have now given social clicks the power to not only have influence during the normal school hours, but also the ability to slander an individual, send text or chat messages to tease the

individual, or even post inappropriate pictures of the individual online, making the bullying almost impossible to circumvent. While social learning theory has been utilized in educational settings for positive learning experiences, in this context it is extremely dangerous and leads to the increased probability of cyberbullying.

Social control theory may also be applicable to increased improper behavior in that when social constraints on antisocial behavior are weakened or absent, delinquent behavior emerges [5]. Many children who utilize the Internet for social networking, chatting, etc. are not in the presence of their parents therefore the absence of parental involvement and guidance may increase the probability of delinquent behavior in the online social environment. In situations such as this, Chaffin [6] asserts that cyberbullying is more likely to occur because of increased anonymity; group norms, groupthink, deindividuation, and dehumanization, and loss of empathy found in online social settings (p. 7-9). These characteristics are valid causes for legal concern and could be factors strongly correlated with cyberbullying behavior.

LITERATURE REVIEW

Hinduja and Patchin [7] describe cyberbullying as 1) behavior that is deliberate not accidental; 2) behavior that is repeated, rather than a one-time incident; 3) behavior in which harm occurs- from the perspective of the target; and 4) behavior executed using the benefit of technology. Cyberbullying has also been defined as any type of bullying or aggressive activity that happens through the use of modern technological devices [8]. Cyberbullying can include but is not limited to derogatory statements, threats to an individual, or sexual harassment. With the increased use of social networking by students particularly while they are off campus, legal systems are finding it hard to regulate and discipline improper behavior on these sites [9] [6].

Multiple forms of bullying exist but the most common forms are limited to physical, verbal and relational bullying [6]. Physical bullying occurs in traditional settings such as at school and usually results in pushing, shoving, or beating up an individual. Verbal bullying is any type of verbal teasing. This could be in the form of name-calling or any type of verbal abuse intended to hurt the individual the bullying is directed towards. With the use of mobile devices, instant messaging, and social networking sites, verbal bullying can take place via text message or chatting. Of all three forms of bullying, physical represents one-third of reported incidents while verbal bullying accounts for seventy percent of bullying incidents [6]. Relational bullying is less likely to occur but does so when an individual uses his/her power in a relationship to convince others to act or behave in a certain way. This type of bullying can also be intermingled in online settings. Cyberbullying can then be any form of bullying that is performed through an electronic device. Students have indicated that cyberbullying exacerbates traditional methods of bullying since cyberbullying is often inescapable as students continue to deal with this type of behavior after school hours. The most dire consequences of cyberbullying may include student depression or in some cases, suicide [10] [11].

Another issue connected to cyberbullying is the increased access to and uploading capability of photographs and videos. This is particularly targeted at social networking sites but can also be a part of blogs, wikis, and individual websites. In a digital age where most computers and mobile phones have sophisticated cameras and video recording capabilities, students are finding themselves involved in litigation from incriminating documents placed on the Internet. Some schools are even monitoring student athletic pages to ensure proper behavior [12]. One cited case example occurred in Rhode Island when pictures from a Facebook account played a major role in a court ruling regarding a drunk driving incident. The court judge, after being presented incriminating pictures of the defendant at a party retrievable from a social networking site, deemed the individual's lifestyle as out of control and an indication that this was not a one-time incident [13]. Privacy policies in place per site try to accommodate privacy issues. However, none are responsible in matters where privacy is breeched. Although policies can give individuals a sense of protection, negative ramifications for pictures that are privately posted are increasing. Furthermore, individuals are being prosecuted even when others upload their pictures and sites do not provide any way to remove these incriminating documents once individuals are aware that they exist.

School Administrators should proceed with caution when disciplining students for cyberbullying offenses. The constitutional protections of students include due process and free speech [9]. Due process provides a student with the opportunity to go through a fair and equitable process when a legal accusation has been made. So, for example, if students were talking about a teacher on a MySpace group page and the principal caught them, if the principal initially suspends the students without providing due process, the courts are likely to rule in favor of the students since they were not afforded due process. Due process is a common procedure that all school administrators along with Instructional Technology and Design (ITD) professionals should be aware of.

Regarding the student's right to free speech, although K-12 teachers and administrators make every effort to teach children appropriate behavior and respect, every student has the right to say whatever they choose based on their First Amendment rights. What is important to understand nonetheless is that these rights are limited in the context of educational settings. Off campus and

Internet speech are harder to regulate since these activities occur away the school campus and outside of normal school hours. Courts are apt to rule in favor of schools that have taken action to regulate or monitor students off-campus and/or Internet speech [9]. However, schools should use caution to ensure that disciplinary actions are taken because of potential disruption to the educational process as opposed to individual perceptions of inappropriate, offensive, or hateful speech. Courts have been reluctant to require schools to intervene for fear that this power might end up interfering with the students' freedom of speech; yet when related to school safety or disruption of the educational process, courts have granted favor to schools for action taken.

METHODOLOGY

Description of Procedures

After IRB approval, a modified questionnaire developed by the Center for Safe and Responsible Internet Use (CSRIU) will be given to college students regarding their high school experiences with cyberbullying, both as a cyberbully and as a victim during high school. Questions will solicit demographic responses and responses regarding the following types of cyberbullying as defined by Willard [14]: Flaming--defined as angry, rude, vulgar messages about a person to an online group or person via email or texting; Online Harassment--defined as repeatedly sending offensive messages via e-mail or other text messaging to a person; Cyberstalking--defined as online harassment that include threats of harm or is excessively intimidating; Denigration (put-downs)--defined as sending harmful, untrue, or cruel statements about a person to other people or posting such material online; Masquerading--defined as pretending to be someone else and sending or posting material that makes that person look bad; Outing--defined as sending or posting material about a person that contains sensitive, private, or embarrassing information, including forwarding private messages or images; and Excluding--defined as cruelly excluding someone from an online group. (p. 2).

Participants

Participants will be college freshman enrolled in a university located in the southern region of the United States. These students will be questioned regarding their high school experience(s), or lack thereof, as a victim or perpetrator of cyberbullying.

Research Questions

The research questions guiding this study will be: 1) To what extent have high school students been the victim of cyberbullying? 2) What are the most common forms of cyberbullying? 3) To what extent have high school students initiated acts of cyberbullying? 4) What forms of cyberbullying were used by those who self-identified as cyberbullies? 5) What was the impact of cyberbullying on the emotional and physical well being of high school students?

Instrument

The instrument was initially developed by the Center for Safe and Responsible Internet Use located in Eugene, Oregon. Permission to modify and use this instrument was given by Nancy Willard, M.S., J.D., Director. The instrument will contain questions to solicit self-identified initiated acts of cyberbullying and personal incidences of being the victim of cyberbullying, along with how frequently it happens, where it happens, and its effect on students.

The demographic section of the questionnaire includes questions regarding participant's gender, and use of the Internet and cell phone. The original instrument included questions pertaining to the experiences, or lack thereof, of the participant as a victim of cyberbullying. Modifications of the instrument included questions pertaining to the experiences, or lack thereof, of the participant as a cyberbully.

The instrument includes 3 questions each regarding Flaming, Online Harassment, Cyberstalking, Denigration, Masquerading, Outing, and Excluding. Additionally, there are 10 questions pertain to the location, frequency and normality of cyberbullying, the role of the participant as victim, perpetrator, or witness, the types of devices used, to whom cyberbullying was reported, and the social acceptance of cyberbullying.

Analysis Procedures

Data for this study will be entered into the statistical analysis program called SPSS. To answer research questions one and three, an independent-sample t-test will be conducted to determine if there are significant levels of self-reported incidences of cyberbullying (RQ1) and/or self-reported levels of initiated cyberbullying acts (RQ3). For research question two, based on validity and reliability reporting of the instrument author, frequencies of forms of cyberbullying will be reported to indicate the most prevalent forms of cyberbullying students encounter. A Pearson correlation will be conducted to determine if a relationship existed between sub-categories as they relate to participant demographics. Research question four will be answered by selecting the group of participants who self-reported initiating acts of cyberbullying to determine the most commons forms utilized to bully others and whether these forms are statistically significant to the population or merely representative of the specific participants in the study's sample. Research question five will explore

frequencies of self-reported answers on the respective question to each form of cyberbullying, "On the following scale, what is your reaction to harassment? There are four responses participants will be provided ranging from "no big deal" to "very upsetting" to indicate the level of impact that particular form of cyberbullying had on the emotional and physical well-being the respective participant. Participants will also be provided a "no opinion" selection should this form of cyberbullying have no impact on the respective participant or if they've never had that type of cyberbullying harassment therefore have no opinion on the reaction to such harassment. Research question six will be answered with two open-ended questions that ask students to self-report support available at their respective high school for students dealing with cyberbullying as well as the types of services they believe are needed to support cyberbullying victims. Open-ended responses will be analyzed by using a selective coding technique to develop topical categories for each qualitative response set and a nominal ordinal method recording the relative frequency for each response category to quantify responses [15]. Data will be transcribed and coded to determine if any themes exist, thus providing insight to the phenomenon surrounding responses.

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Self-concept development and inclusive education

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ABSTRACT

The encouragement of the development of a realistic self-concept of the children in their classes is an important challenge for school teachers [1, 2, 3, 4]. Children who know about their strengths and weaknesses can work on the competences, which need to be improved, more effectively. This contribution presents a study which looked at this special time during the development of children in Germany focusing inclusive classes.

Keywords: First-grade, Inclusive Education, Mathematical Competences, Self-concept, Visual Impairment

1. INTRODUCTION

The study accompanied first-grade students and their teachers looking at the development of the children's self-concepts concerning their mathematical competences. Looking at inclusive classes with children who have visual impairments, the aim has been to find out whether there are differences in the self-concept development of the children with and without visual impairment and how teachers cope with the special needs of their students.

2. OBJECTIVES

This contribution presents the outcomes of analysis in the context of the study. The main research questions were, if there is a significant difference in the self-concept development of the students with and without visual impairment as well as if there is an effect of activities which give children a chance to think about their own strengths and competences who need to be improved because they are not as high as they could.

3. THEORETICAL FRAMEWORK

The multidimensional self-concept model of Shavelson, Hubner und Stanton [5] is used as theoretical framework as well as the discourse on inclusive education [6] and the "mathe 2000"-project which focuses on effective teaching techniques in math lessons [7].

4. METHODS

Research has taken place at the beginning, in the middle and at the end of first-grade by interviewing all 94 students of five classes in order to find out how they rate their mathematical competences and their position in class. Furthermore the children attended mathematical tests [8] in order to gain data for comparison of the actual skills with their self-concepts. Interviews with the teachers provided a basis for analysing the teaching methods they use and their overall strategies to meet the heterogeneity in their class. Researcher's observations of school lessons completed the design of the study.

5. RESULTS

By using a longitudinal research design as well as a combination of quantitative and qualitative data interpretation techniques interesting results have been found concerning possibilities of fostering realistic self-concepts. The data shows that there is no significant difference in the self-concept development of children with and without visual impairment in the sample. Activities during school lessons which encourage children to rate their competences on their own can help to build a realistic self-concept as the self-concept of the classes in which such activities took place the childrens' self-concepts proved to be more realistic than the ones in the classes without this kind of practice.

6. CONCLUSIONS

Aspects of teaching methods and the children's view on their school experiences in an inclusive environment are of interest [9] as children with visual impairment mostly have been taught in special schools in Germany but inclusive schooling will be the choice of the future as the German government claims. Furthermore heterogeneity is found in every school class and therefore one of the challenges for teachers is to cope with the different needs of their students in order to provide helpful teaching surroundings. This work can function as a basis for further research in this field.

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Evaluation of open-source e-Learning platforms based on the Qualitative Weight and Sum approach and Analytic Hierarchy Process

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ABSTRACT

E-learning is now playing a very important role in learning processes and the major concern in all education institutions and universities. Open source e-learning platforms are one of the latest e-learning management systems used to deliver e-learning courses in most of the universities and higher educational institutions in the entire world, also in Jordan. There is a need to compare and evaluate these platforms to assess their weaknesses and strengths. It is currently not clear what the best method to evaluate these platforms. A number of studies have been carried out in this field already, but there is still a need for further analysis to choose the best platforms [1]. This paper presents an evaluation of open source e-learning platforms. Based on the functionality of these platforms and the main characteristics provided of each platform we combined the Qualitative Weight and Sum (QWS) and the Analytic Hierarchy Process (AHP) approaches for the evaluation process of these open source e-learning platforms. For our research we used all open source e-learning platforms that are implemented and used at all Jordan Universities. The result for the evaluation in Jordan shows that all Jordanian universities use open source e-learning platforms and that the Moodle platform is the most widely used. However, Intelligent Web Teacher (IWT) obtained the highest evaluation results according to the QWS and ASP approach. Claroline comes in the second place. Both IWT and Claroline are highly recommended to be used. The results of this research paper will be very useful for higher institutions in Jordan and all over the world to decide which open source platforms will be more reliable and beneficial in their institutions and which features of these e-learning platforms are the most important to be activated when implementing the open source platform. This research also helps the open-source e-learning platform software developer to decide which features are more important for learners based on the scores in the evaluation

Keywords: e-learning systems, open source software, evaluation approach, qualitative weight and sum, analytic hierarchy process, Jordan universities.

1. INTRODUCTION

E-learning makes knowledge transfer possible in a way that can have definite economic and educational value. E-learning has become a fundamental and decisive aspect of professions related to the new economy [2, 3]. E-learning is a complement to and sometimes overtaking conventional classroom teaching methods. Various organizations and institutions across the world are moving toward adopting e-learning as their principal teaching and training method [4, 5].

E-learning open source platforms are now playing a major role in changing the existing ways of teaching and learning methods in higher educational institutions. The demands on higher education require a fundamental change towards new technologies and to choose the best of them [6, 7]. Open source E-learning platforms can be thought of as the main solution to provide e-learning courses to students. There are several open-source E-learning systems which support different capabilities and it is very important to choose the best platform that fits the E-learning needs of each institution. Although Blackboard is still a big player, various institutions are moving toward adopting open-source platforms because open-source platforms provide the opportunity to add specific features to such systems according to the university's needs. In addition, since these kinds of systems are maintained by a very large group of programmers, they are regularly updated and in each release technical problems are resolved and upgraded. All these open-source programs are freely available to general public [8, 9], although sometimes there are charges and fees for support.

Because there are many different open source platforms and most of the world's universities and higher education institutions use different platforms, this variety makes the evaluation of this kind of platforms difficult [10]. There are multiple criteria and methods to evaluate them, and frameworks and models are required to drive this evaluation. So the goal of this paper is to show a model for selecting the most suitable E-learning solution taking into

account its technological and pedagogical aspects. In literature there are many approaches to evaluating E-learning platform [14].

Britain & Liber proposed a "Framework for Pedagogical Evaluation of Virtual Learning Environments" [11]. This framework considers two models upon which an evaluation strategy may be based. The first one comes from the Conversation Framework [12] that addresses several ways the learning process is produced in an e-learning platform. Another model for the evaluation is based on the Viable Systems Model (VSM) and was proposed by Britain & Liber themselves. Based on each model, Britain & Liber propose different criteria to evaluate how e-learning platforms address the model's learning characteristics. Subjective methods such as filling questionnaires or elaborating comparison grids are used to decide if a learning platform meets the selected criteria. Another basic framework is proposed [13] to distinguish between the many ways in which Virtual Learning Environments (VLEs) can be evaluated. Félix Buendía García [10] provided a framework that is based on the use of the SCORM standard specifications that allow instructors to employ benchmark tests to evaluate e-learning platforms. The framework includes the purpose of the evaluation, the type of methods that might be used and the measures employed. The authors described the different roles for evaluation, the types of experiments to be performed and criteria to evaluate the usability or the learning effectiveness. Their proposed evaluation methods range from interpreting results and identifying processes and outcomes, to detecting the type of data or participants. Additionally, several measures (e.g. usability heuristics, frequency of interactions or learning outcomes) are included in their framework [10].

2. MATERIALS AND METHOD

In this paper we have used the Qualitative weight and sum (QWS) approach as in [15] and the Analytic Hierarchy Process (AHP) used in [14] for evaluating new and additional characteristics in addition to the characteristics studied in previous literature about these e-learning platforms for different open source platforms. For this purpose a questionnaire was designed and given to students in Systems Analysis course at Jordan University. Those students have experience in using the e-learning platform that is implemented and used at Jordan University.

The qualitative weight and sum (QWS) approach is a well-established approach for the evaluation of software products. It establishes and weights a list of criteria. QWS is based on the use of symbols. There are six qualitative levels of importance for the weights, frequently symbols are used: E = essential, * = extremely valuable, # = very valuable, + = valuable, | = marginally valuable and 0 = not valuable. The weight of a criterion determines the range of values that can be used to measure a product's performance.

The AHP which was developed by Thomas Saaty is an effective means of dealing with complex decision-making. AHP helps capture both subjective and objective evaluation measures, providing a useful mechanism for checking their consistency relative to considered alternatives, thus reducing bias in decision making [17]. The AHP approach allows not only to evaluate the platforms but also to test the application that's why we used both the QWS and the AHP approaches.

We have summarized all the symbols in Table [1] below with their weights. Ranking for each platform are subjective.

	QWS	Weight in AHP
essential	**E**	**5**
extremely valuable	*****	**4**
very valuable	**#**	**3**
valuable	**+**	**2**
marginally valuable	**|**	**1**
not valuable.	**0**	**0**

Table [1] A summary of all the symbols with their weights according to QWS and AHP

3. DISCUSSION AND RESULTS

We used the QWS approach for evaluation of e-learning open source platforms, because it is a well-established and known approach for the evaluation of software products. The differentiated results highlight the strengths and limitations of the platforms. We applied the evaluation approach with QWS in a way where the essential criteria are assessed in a pre-evaluation phase, similar to Baumgartner [15] and [16]. The minimum criteria that we have chosen which cover the major general requirements of each platform are: Social Networking Tools, Productivity Tools & Software Installation, Administration Tools & Security, Presentation Tools and Material Distribution, and Management Features.

For the evaluation, we have selected the nine most well-known open source e-learning platforms and evaluated these according to the minimum criteria that were mentioned in the previous paragraph. The nine platforms are : Dokeos (version 1.8.6) [17], Claroline (version 1.11) [18], IWT (version 1.1) [19], ILIAS (version 4.2.1) [20], Moodle (version 2.0) [21], Atutor (version 2.0.3) [22], LON-CAPA (version 2.10.0) [23], OpenUSS (version 1.1) [24]. ADA (version 1.7.1) [25]. Next, these nine platforms were tested in detail with real life examples from universities in Jordan. Almost all of the universities here implement the open source platforms we have studied and analyzed. These platforms were tested according to the following features provided by each platform : On-Line User Registration, Course List, Course Indexing, New Course Creation, Contents Import, Contents Sharing Contents Insertion, Multi Course Management, Multi-User Management, Assessment Management, Report, Student's Group, Management, Progress Tracking, Virtual Classroom, Application Sharing Contents, Download, Organization of course objects, Assessment of tests, Administration of courses, Security, Authorization

management, User management, Installation of the platform, Assistance, Documentation, Conferences, Announcements, Learning material, Exercises, Assignment & Quizzes, Whiteboard, Chat, Forum, E-Mail.

We classified the characteristics to the nine minimum criteria and categories as discussed above. These criteria and categories have several subcategories as described in Table [1, 2, 3, 4, and 5] below. Several attributes measure the characteristics of each subcategory. Only the subcategories are weighted and evaluated and then we have calculated the weighted sum and divided by the total weighted sum for the subcategory in other words we calculated the weighted average. After that we calculated the percentages of these categories as in equation (1,2).

Subcategory weight =

$$\sum_{k=0}^{n}(\text{feature weight}) \quad \text{.....eq(1)}$$

Here n is the number of features and feature weight is the weight of the QWS symbol weighted in AHP approach.

Sub category percentage =

$$\frac{\text{Minimum criteria weight}}{\text{Total weight of all symbols}} * 100\% \quad \text{.....eq(2)}$$

Here "total weight of all symbols" is the total symbol weight of in the QWS approach as shown in table 1 for a specific subcategory.

The features in each subcategory are weighted and calculated from the questionnaire's answers. According to the QWS approach, these values are summarized for each category by using the number of each symbol. The evaluation value of the platform is calculated equivalently and after that we used the Analytic Hierarchy Process (AHP) to calculate the weight for each subcategory. The final evaluation of each platform is calculated by the total summation of all sub categories according to equation (3)

Platform Final Evaluation =

$$\sum_{k=0}^{n}\left(\frac{\text{Platform category weight}}{\text{no of sub categories}}\right) * 100\% \quad \text{.....eq(3)}$$

Here n is the number of categories in the same platform.

	Feature	Calculated Percentage
social networking Tools	Chat	1.2%
	Forum	0.98%
	E-Mail	4.9%
	Contents Sharing	3.2%
	Conferences	2.1%
Subcategory weight:		12.38

Table [2] Subcategory for Social Networking Tools

	Feature	Calculated Percentage
Productivity Tools & software Installation	Application, Download	2.8%
	Objects	2.4%
	Installation of the platform	4.7%
	Assistance	0.97%
	Documentation	3.1%
	Virtual Classroom	1.8%
Subcategory weight:		15.77

Table [3] Subcategory for productivity tools

	feature	Calculated Percentage
Administration Tools & security	Administration of courses	4.5%
	Progress Tracking	1.9%
	On-Line User Registration	2.2%
	New Course Creation	5.1%
	Report	2.8%
	Organization of course	0.87%
	Assessment of tests	5.8%
	Security	4.3%
Subcategory weight:		27.47%

Table [4] Subcategory for Administration Tools

	feature	Calculated Percentage
Presentation Tools and Material Distribution	Announcements	2.7%
	Learning material	4.8%
	Exercises	4.1%
	Assignment & Quizzes	3.9%
	Whiteboard	3.2%
	Course List	5.1%
	Course Indexing	1.9%
	Contents Import	3.7%
	Contents Insertion & download	3.2%
Subcategory weight:		28.5%

Table [5] Subcategory for Presentation Tools

	feature	Calculated Percentage
Management Features	MultiCourse Management	2.7%
	Multi-User Management	2.1%
	Assessment Management	3.5%
	Student's Group	2.8%
	Management	4.1%
	User management	2.7%
	Authorization management	3.4%
Subcategory weight:		21.2%

Table [6] Subcategory for Management Features

	Assessment of tests	Organization of course objects	Application Sharing	Virtual Classroom	Progress Tracking	Student's Group Management	Report	Assessment Management	Multi-User Management	Multi Course Management	Contents Insertion	Contents Sharing	Contents Import	New Course Creation	Course Indexing	Course List	On-Line User Registration
Dokeos	1.7	1.7	0.8	0.93	1.7	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
Claroline	1.7	1.7	0.0	0.0	1.7	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
IWT	1.7	1.7	0.8	0.93	1.7	0.0	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
ILIAS	1.7	1.7	0.0	0.0	1.7	1.4	0.0	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
Moodle	1.7	1.7	0.0	0.0	1.7	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
Atutor	1.7	1.7	0.0	0.0	1.7	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
LON-CAPA	1.7	1.7	0.0	0.0	1.7	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
OpenUSS	1.7	1.7	0.0	0.0	1.7	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7
ADA	1.7	1.7	0.0	0.0	0.0	1.4	1.7	1.4	1.4	1.4	2.1	0.8	2.1	1.7	2.1	2.1	1.7

Table[7] Platform final evaluation. It continues below. Note Numbers are given in percentages.

	E-mail	Forum	Chat	Whiteboard	Assignment & Quizzes	Exercises	Learning Material	Announcements	Conferences	Documentation	Assistance	Platform Installation	User Management	Authorization Mangmt.	Security	Administration of courses
Dokeos	0.8	0.8	0.8	2.1	2.1	0.0	2.1	2.1	0.8	0.93	0.93	0.93	1.4	0.0	0.0	1.7
Claroline	0.8	0.8	0.8	2.1	2.1	2.1	2.1	2.1	0.0	0.93	0.93	0.93	1.4	1.4	1.7	1.7
IWT	0.8	0.8	0.8	2.1	2.1	2.1	2.1	2.1	0.0	0.93	0.93	0.93	1.4	1.4	1.7	1.7
ILIAS	0.8	0.8	0.8	2.1	2.1	0.0	2.1	0.0	0.0	0.93	0.93	0.93	1.4	1.4	1.7	1.7
Moodle	0.8	0.8	0.8	2.1	2.1	2.1	2.1	2.1	0.0	0.93	0.93	0.93	1.4	1.4	1.7	1.7
Atutor	0.8	0.8	0.8	2.1	2.1	0.0	2.1	2.1	0.0	0.93	0.93	0.93	0.0	1.4	0.0	1.7
LON-CAPA	0.8	0.8	0.8	2.1	2.1	2.1	2.1	2.1	0.0	0.93	0.93	0.93	1.4	1.4	1.7	1.7
OpenUSS	0.8	0.8	0.8	2.1	2.1	0.0	2.1	2.1	0.0	0.93	0.93	0.0	0.0	0.0	1.7	0.0
ADA	0.8	0.8	0.8	2.1	2.1	2.1	2.1	2.1	0.0	0.93	0.93	0.93	1.4	1.4	1.7	1.7

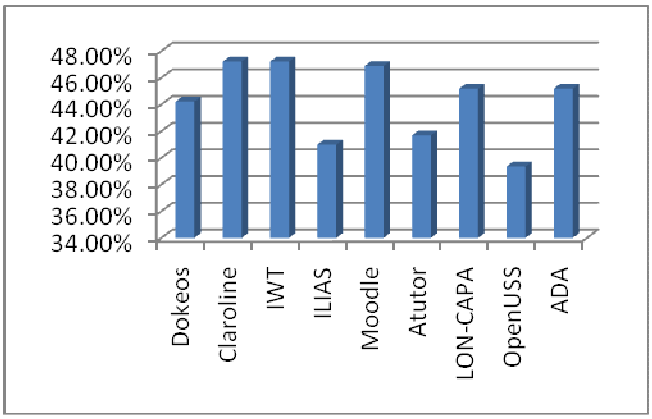

Figure [1] chart for the final results of the open source e-learning platform evaluation

The IWT platform gave a good result when we tested it according to the chosen minimum categories. The overall evaluation result shows the results for each platform and each subcategory, classified by categories. If such a category is considered important, then our method can suggest a better platform that has a high weight in most categories such as IWT and Claroline (see Table [7] below). The best results of each category are highlighted.

However, and as shown in Figure 1, it can be seen that the Intelligent Web Teacher (IWT) achieved a high evaluation values. Claroline, which is used by two Jordanian universities, also dominate the evaluation by achieving the best value in the total summation of the sub categories. The strengths of Claroline are the high scores for the criteria of Social Networking, Productivity Tools, Software Installation, Administration Tools and Security. Additional strengths of Claroline are the Management Features, Presentation Tools and Material Distribution. Furthermore, the outstanding usability of Calroline leads to the maximum evaluation value in the usability category.
The third place goes to Moodle. This platform has been used in six Jordanian Universities (University of Jordan, Hashemite University, Mutah University, Jordan University of Science and Technology, Balqa Applied University , German-Jordanian University) . The LON-CAPA, and ADA platforms are ranked equally at the fourth position, ILIAS and Atutor are ranked at the fifth position and the sixth position, whereas OpenUSS is ranked last. The reason for the low ranking of OpenUSS is that so far only the basic features are realized. However, the quality of these features is very good.

Open source e-learning platforms in Jordanian Universities:

University and educational organizations have different strategies in deploying E-learning systems. All universities in Jordan use open source E-learning platforms which are integrated into the university portals. Integration is considered desirable as it generally improve the content quality of e-learning system. This most frequently used open system system in Jordan universities is, according to this research Moodle.

We have studied all universities in Jordan accredited by the Ministry of Higher Education in Jordan and almost all of them are adopting open source e-learning platforms, as shown in Table [8].

PLATFORM / UNIVERSITY	Dokeos	IWT	ILIAS	Moodle	Atutor	LON-CAPA	OpenUSS	ADA	Dokeos	Claroline	Blackboard
University of Jordan				√							
Yarmouk University										√	
Al-Hussein Bin Talal University										√	
Hashemite University				√							
Al al-Bayt University											√
Mutah University				√							
Jordan University of Science and Technology				√							
Balqa Applied University				√							
German-Jordanian University				√							

Table [8] shows the platforms adopted in all of the Jordanian Universities.

To investigate the implementation of open source elearning systems in the Jordanian Universities and to conduct the study, the following research questions were studied:

- What is the most frequently used open source e-learning platform implemented in Jordanian Universities?
- What percentages of the Jordanian universities in Jordan implement e-learning in their learning process?
- What percentage of Jordanian Universities in Jordan use open source software as e-learning platform?
- What percentage of Jordanian Universities in Jordan developed there own e-learning platform?

The numbers about the open source implementation in Jordanian universities are shown in table [9]. The data in this table shows how many universities and the percentage provide an open source E-learning platform, the percentage of every type of open source E-learning platform, and the most frequently used platform (compare figure [2])

E Learning	**All Universities in Jordan (No.=9)**	
	Number	percentage
Open source E-learning platform	8	88%
Commercial E-learning platform	1	12%
Own developed E-learning platform	0	0%
Most frequently used E-learning platform: Moodle	6	66%
The E-learning platform is part of the university website	9	100 %

Table[9] Open-Source implementation in Jordanian Universities

It is seen from table 9 shows that the majority of the software implemented in E-learning systems in Jordan is based on open source E-learning platforms, 8 out of 9 for universities (88%). The most frequently used open source platform is Moodle, almost 66% use this platform. All E-learning systems are integrated with the website of the university. This is desirable as integration will improve the ease of access of the E-learning system.

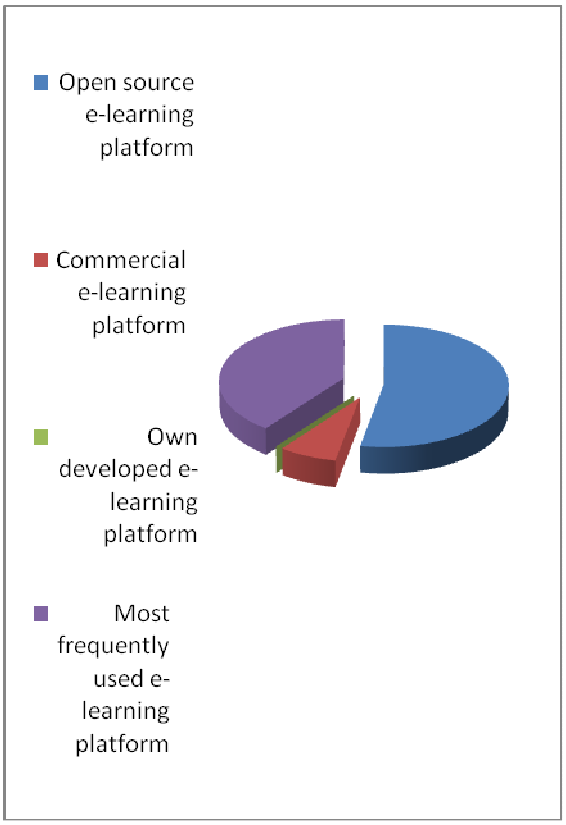

Figure [2] percentage of Jordanian universities using open source E-learning platforms.

4. CONCLUSION

Although Commercial E-learning platforms like Blackboard is still a big player, various organizations and educational institutions all over the world are moving toward adopting open-source E-learning platforms because open-source platforms provide the opportunity to add specific features to such systems according to the university's needs. These platforms occupy an ever increasing and preeminent role in the teaching and learning process in these institutions. This research paper will help higher educational institutions to decide what the best open source E-learning platform is for their purposes, based on the results of a thorough evaluation of these platforms.

This evaluation of open source E-learning platforms was done by combining both QWS and AHP approaches. This combination of the two approaches for this purpose is new. The evaluation was carried out by evaluating the open source e-learning at all Jordanian universities. The research showed that the highest evaluated e-learning platform is Intelligent Web Teacher (IWT), followed by claroline and in third place the Moodle E-learning platform. The most frequently used open source system in Jordan universities is Moodle.

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Present@
An environment for virtual dissertations in final degree projects

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ABSTRACT

A final degree dissertation is one of the last steps of many studies, like engineering degrees. Students usually present the results of their final project in a public dissertation where a committee evaluates their work. Students, in this activity, deal with competences like making effective oral presentations in public environments in an stressful situation. But, can one achieve this goal in a virtual environment?

At Universitat Oberta de Catalunya (UOC), a 100% virtual university, a solution is proposed based on video presentations that are uploaded in a tool, Present@, that allows them to share the presentations with their partners and with the committee and allows for questions and answers in an open environment.

131 students have been using Present@ during 4 semesters. To evaluate the tool, students have answered a questionnaire and from the answers received we conclude that this approach allows virtual students to acquire most of the competences associated with the final degree project and, specifically, with the virtual dissertation in virtual environments. Maybe the only feature they do not face, is the stress of the face to face questions.

Keywords
Final degree project, virtual dissertation, presentation

1. INTRODUCTION

At the end of their technical studies, students have to present a final project in order to get the degree. Usually, this has to be an original project, where students have to prove that have "got" all of the competences they should have acquired.

Many students are able to develop very good engineering projects, where they show their technical abilities and a dominion of the technical competences developed during their studies. But a degree project is not only focused on technical competences, but also on those "transversal" competences that are also included in the European Space of Higher Education (EEHE).

In this article we will explain the experience of the UOC in the final degree project (FDP) of the engineering degrees offered by the Computer and Multimedia Studies Department, regarding the final degree dissertation.

We start with the UOC context and in the following sections the elements that distinguish the FDP at UOC from most of the face to face (F2F) universities. This will allow us to show the problems we face. After that, the solution is presented: Present@, and how it solves some of the problems previously stated. It is also established the dimensions that will be used to analyze how good the solution is. Then, the results from the questionnaires are presented and discussed. The paper finishes with the conclusions.

2. CONTEXT

The Universitat Oberta de Catalunya (UOC from here on) has established itself as a prestigious university in the environment of virtual universities, which corresponds 100% to online learning. Specific trails of this university relate to its internal structure and to the peculiarities of their students.

At UOC, teaching action is carried out by different figures with different roles that complement each other. These roles include tutor, consultant and coordinator.

The tutor is the contact of the student with the university. Its main task is to guide the students regarding academic items. They are professionals who work part-time with UOC.

The consultant is the expert in a particular subject or subjects and is, in fact, the equivalent of a teacher in the university classroom. As in the case of tutors, they combine their professional career outside UOC with teaching tasks for UOC. This allows that, in most of the cases, students have teachers who have the important added value of a professional background.

The coordinator is a UOC lecturer and is ultimately responsible for the subject, and his or her task is to monitor and control the virtual classrooms and to coordinate the team of consultants of the subject. The coordinator is UOC staff and has no direct contact with the student.

On the other hand, the profile of UOC students also differs from the profile of F2F university students. UOC students choose this university, among other reasons because the virtual environment allows them to combine work and studies. About 80% of students at UOC were working part or full time.

We are therefore in a context that deviates from traditional patterns and, of course, also affects the completion of FDP. In the following sections we will see how the FDP's are evaluated in F2F as well as in virtual universities.

3. PROBLEM STATEMENT

At UOC, various students deal with the same FDP. It is usually is proposed by the teacher, and it have to be delivered at the end of the semester. Since several students work on the same project, the teacher can compare the results from several students and it is even possible to suggest bigger collaborative projects where every single student deals with a given part. It is important also to take into account that the communication between the students and the consultant is through e-mail within the Virtual Campus context, as in the other subjects at UOC, and there is no compulsory personal contact between consultants and students. In this scenario virtual students acquire or improve their competences in writing and communicating in virtual environments, in project management, and in some projects, also team work techniques.

So, these are some advantages of the FDP at UOC, but there are also some disadvantages, especially regarding the virtual presentation of the FDP, as we will show in the next section.

Presentation of final degree projects

One of the most important moments in a final degree project is the public presentation and defense of the students' work. This is a usual procedure in the majority of the universities and despite some differences; it is possible to find some common features.

First of all, there is a committee, usually consisting of at least three people. The student writes a report of his/her work, and submits it to the members of the committee. Then, the student presents his/her work in a time limited oral presentation and, after that, the members of the committee pose questions to the student. After this process, the committee qualifies the final degree project.

This article is focused on the presentation of the FDP. In the following sections, it will be shown the competences that address the presentation and how it was at UOC until the development of Present@, the tool presented in this paper and the problems found.

Competences in the presentation of FDP

Through the process of presenting their work, the students who pass the FDP have worked the following competences (regarding the oral presentation):

1) Synthesizing their work in a presentation which has time limits.
2) Speaking in public.
3) Making oral and visual presentations.
4) Facing questions about their own work in a stressful situation.

All these competencies are key in a professional environment since a large amount of the work of most of the technical professionals consists in preparing and presenting projects. But how deal with all these aspects in an on-line environment like UOC?

Presentation of the final degree projects at UOC

Since UOC is an on-line asynchronous university and the question that arises is: how can students at UOC get all the competences regarding the FDP presentation?

The option that has been used until now is to make a presentation document, with 20 slides maximum, "to be read and not to be presented". Students could use Power Point, LibreOffice[1] or Prezzi[2] to prepare this document and they delivered it with the project report. A few days later, the members of the committee addressed their questions to the student who has to answer them in less than 24 hours. With this method students could address competences 1 and 4.

However, what about competences 2 and 3? Even competence 1 is only "half" addressed since it is not the same to compact the work in an oral presentation, that includes slides as well as a speech, that to compact it in a limited number of slides. On the other hand, students have to deal with a contradiction: "a presentation to be read and not to be presented". In the next section it will be shown how to overcome these limitations.

4. SOLUTION PROPOSED

At this point we have already stated the problems faced by FDP presentations in online environments, regarding the main competences they should address in this exercise.

The solution proposed consists in the following actions that we group in 3 dimensions:

- Learning dimension: students have to elaborate a presentation in video shorter than 20 minutes. This allows addressing competence 1 and 3; and also avoids the contradiction of a "presentation to be read".
- Teaching dimension: students receive a document explaining how to prepare good and effective presentations [3].
- Technical dimension: a web application integrated in the Virtual Campus has been prepared so that students can: 1) upload their presentation file; 2) see and comment their partners' videos; and 3) answer the questions from the committee. This web makes the presentation, questions and answers available to other students and teachers and thus, allows to face competence 2, although in a restricted way; and competence 4.

We think that this method could allow virtual students to face all the competences that should have to be acquired in a final degree project. But, how is this tool?

Present@: the tool for virtual final presentations

The tool introduced in the technical dimension mentioned above is Present@. Its main objective is to allow the uploading of videos and the possibility of developing discussions about them.

It is a Wordpress blog with some new developments and pluggins that allow connecting it with a video streaming server. In ***Figure 1*** the main page of Present@ is shown. It offers the list of videos uploaded, that can be ordered according author name and surname, title, labels, status, license and comments. When clicking on a video file, the video page is accessed (***Figure 2***). There, information about the video is presented and the video can be visualized. Comments can also be added. Finally, for video uploading the Wordpress page is used (***Figure 3***). It can be seen that this is a complex page and this is one of the items that should be improved in future versions.

5. RESULTS

The new approach to virtual presentations in online environments has been tested during 6 semesters and 131 students have been questioned about the several items introduced by this software: teaching documentation and preparing a video-presentation. 82 students were questioned during 5 semesters about the public virtual-debate (an option which was introduced a bit later). Finally, two semesters ago, the new tool Present@ was formally introduced and 33 students were asked about the tool. In this section results from the questionnaires regarding every action are presented.

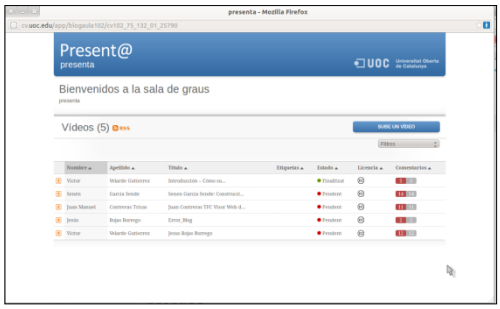

Figure 1 Main page of Present@.

Figure 2 Present@: inside a video

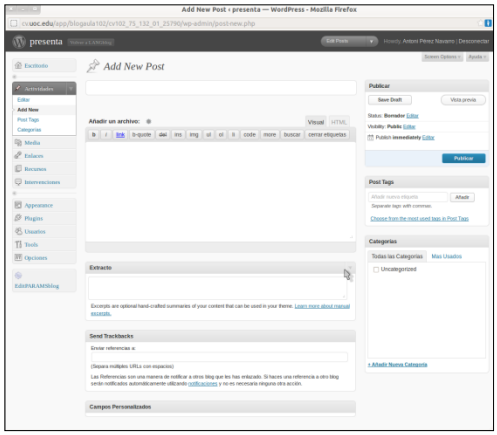

Figure 3 Page to upload videos

Teaching material

Regarding the teaching material strictly related with the final project presentation, students were asked the following questions:

1) *How useful did you find the material?* Students could choose between four options in a Likert scale. Nearly 80% of the students were satisfied or very satisfied with the teaching material.

However nearly 14% of students say they did not read the teaching material.

2) *What kind of contents did you miss?* This was an optional open question and 44 students answered. 30% of them say just that material is O.K. and another 30% complains about specific features of his or her own project. The remaining 40% says that the teaching material could be improved with: specific contents about visual presentations and more examples, 23% (teaching dimension); technical aspects about preparing visual presentation, even a tutorial of the more common tools, 17% (technical dimension); performance aspects regarding on how to act (learning dimension). This last aspect comes only from about 5% of the answers (two students), but it is important since shows how stressing the video recording has been for some students.

Making visual presentations

The second item evaluated is the elaboration of visual presentations. In the following items we will show the questions and answers found:

- *What was the software used?* This was an open question since students were free to choose the software they wanted. The most used software was Camtasia Studio[4], that was employed by 80% of the students. Other software used were CamStudio (9%) [5], and, with no more than 1%-2% of users: FireScreen, Quicktime [6], FlexBuilder [7], Windows Movie Maker [8], iMovie [9], PresenterSoftPower VideoMaker [|0] and RecordMyDesktop [11].
- *Have the students used previously recording software*? Only 25% of the students have previously used this kind of software.
- About the software, students have to evaluate the following questions in a Likert scale between 1 and 5.
  - *Was the teaching material useful in this step?* About 70% of the responses were in the 3 to 5 range and 45% between 4 and 5; only about 10% of the students marks 1 (they did not find teaching materials useful at all).
  - *Did you use what you learned in the teaching material?* The percentages of answers are very similar to previous item, but this time there are 20% more 4 marks than 5 marks, i.e., students find materials useful, but not always apply them.
  - *Does post-edition help to save time?* About 80% of the students mark 3, 4 or 5, and 46% mark 4 or 5. Only 7% of the students think that post-edition does not save time.
  - *Is the time needed to learn how the software works adequate?* Since 80% of students used Camtasia, the answer to this question can be thought as referring to this software. 73% of the students mark 3, 4 or 5, and 48% 4 or 5. Only 7% found it difficult to use the software.
  - *Is post-edition a fundamental item?* Nearly 90% of the students think that post-edition is important, with marks 3, 4 or 5, and 68% mark 4 or 5. Only 4% think that it is not important.

The answers to these questions explain why students choose Camtasia Studio: they find it easy to learn; and find the post-edition capabilities that the software offers both important and time-saving.

The next set of questions refers to preparing the presentation, and students have to evaluate them in a Likert scale between 1 and 5.

- *Was the teaching material useful in this step?* This time 42% of the students mark 4 or 5. Only 8% found the material useless.
- *Did you apply what you learned in the teaching material?* The results in this question are very close to the previous one and find that students find the teaching material quite useful, and apply what they learn.
- *Was it easy to create the video*? Although only 25% of the students have made this kind of work previously, 42% of them mark 4 or 5. Only 6% found it difficult.
- *Would it have been better to give a static presentation?* This time only 48% of the students mark 3, 4 or 5 and 29% between 4 and 5; 51% mark 1 or 2, i.e., they prefer video-presentations.
- *Did students learn how to make better presentations?* This time 79% of the students mark 4 or 5. Only 5% of the students said that they did not learn to make better presentations.
- *Were there problems in uploading the presentation?* Although Present@ is a prototype, only 37% of the students mark 1 or 2, and 47% mark 4 or 5, that is most of them had no difficulties with uploading.
- *Was it an enriching experience?* 74% of the students mark 4 or 5. Only 3% mark 1, that is, they did not find it an enriching experience at all.
- *After the experience, will you use this kind of software again to transmit their ideas?* About 92% of the students said yes.
- *What is the best aspect of making visual presentations?* This is an open question about the learning dimension. 57% of the students gave answers regarding its personal enrichment, preparation and experience (even professional experience). 29% emphasize the technical aspect, since they say that the best is learning to use the software, including, edition and post-edition. There are a 9% of the students that compare with F2F situations and say that thanks to the video presentations, F2F and virtual experiences are very close. We find also about 4% of the students

that highlight the possibilities of webcasting. Finally, we found about 3% of the students that see nothing positive in this kind of presentations.

- *What is the worst aspect of making visual presentations?* This was also an open question. 30% of the students complain about time: they have to invest extra time to learn new software, as it requires more time to prepare a video-presentation than a "presentation to be read"; also, they would like to have more time in order to get a better result, for instance they would prefer longer presentations (more than 20 minutes) and save time in reducing the duration of the presentation. 22% of the students complain about hearing themselves in the video and a 5% complain about scripting capabilities. This item also affects the technical dimension since 17% complain about the software itself, mainly because of the problems with audio level, and the time consumed by testing several software; and 12% complain about the problems to reduce the size of the video file in order to upload it. Only 3% of the students found that nothing has to be improved.
- *What should be improved?* This was also an open question and, in fact is related to the previous ones. Regarding the teaching dimension, 16% of the students say that there should be documents available about how to edit videos, and 12% say that there should be more documentation about how to make presentations (oral expression). Regarding the technical dimension, 30% of the students think that what has to be improved is Present@ itself and the uploading process; and 15% refers to the software used, over which we can do nothing; but 10% of the students suggest that UOC should give a recording tool, even a web UOC tool. Regarding the learning dimension, 13% of the students suggest that presentations should be longer.

It is important to note that one of the students proposed synchronous dissertations.

Public virtual debate

Public virtual debates were introduced some semesters later and 82 students were analyzed. Several questions were addressed:

- *Do students prefer the actual open debate, where their partners can see and comment their work, or closed debates where only teachers could see it?* 93% of the students preferred open debates.
- *What is the best aspect of the public virtual debate?* To this open question the main answers were: about 68% of the students highlight the possibility of sharing and comparing (learning dimension); about 25% highlights teachers and committee member's contributions (teaching dimension). It is important to note also that 4% of the students (3) compared the debate with F2F dissertations.
- *What is the worst aspect of the public virtual debate?* 63% of the students did not answer this question. The main answers were: about 50% complain about time: too short debates, not knowing when the questions will take place, and sometimes too much time waiting for questions; about 20% complain about low participation from the rest of the students; about 7% complains about the low quality or ``danger" arising from questions from their partners. The other students would prefer a private debate.
- *What should be improved?* While 37% of the students offered no response, 35% say everything is O.K. and nothing would have to be changed. 30% would change the duration of the debate. This agrees with complains from students. 31% of the students would include techniques to make their partners comment their work and provide advice and indications to answer questions from the debate (teaching dimension). This high result, once again is compatible with the results of previous question.

It is important to note that 2 students suggested having synchronous debates.

Present@

The last two semesters the new tool Present@, version 2 was introduced and 33 students were asked explicitly about this tool. The questions and answers given are:

- *What is the students' opinion about Present@?* Answers were in a Likert scale with 1 (bad) until 5 (very good). 88% of the students answered between 3 and 5 and 55% between 4 and 5. No student marked 1.
- *What do students liked more?* To this questions students answered: 48% answered simplicity and 48% answered the possibility of commenting the work from their colleagues and seeing everything at the same place: videos from partners, comments, virtual debate, etc. The rest of students highlighted the possibilities offered by the tool.
- *What do students liked less, and what should have to be improved*. In fact, these were two questions but answers were so related that results can be presented together. The answers from students were: 47% complains about technical problems, mainly when uploading the video; 21% say that the comments tool should allow to format and edit comments and a notification should have to be received; 16% of the students say that everything is O.K. and would introduce no improvement; 12% complains about usability; The rest of students suggest that the tool should have to be more used within UOC.

- *Do students recommend the tool in future semesters?* The answer to this question is "yes" from all students but one.

6. DISCUSSION

From the previous section we have seen that students like the new approximation to final degree project dissertations. Moreover, it satisfies the main competences that are worked:

1. Ability of synthesizing their work in a presentation limited in time: complains about time from students show that they have to work and acquire this competence.
2. Ability of speaking in public: once again, comments of students about virtual debate, where they emphasize that can comment and receive comments from the rest of the partners, show that they actually work this competence.
3. Ability of making oral and visual presentations: complains from students about how to make oral and visual presentations show, once again, that this competence is actually worked.
4. Ability of facing questions about their own work in an stress situation: once again, comments from students about the importance of questions from the members of the committee as well as their partners, combined with complains about time, and some comments about stress, show that this competence is also worked.

On the other hand, some material regarding scripting, oral expression and preparing visual presentations should be included. We have also seen that some improvements have to be included in Present@ in order to facilitate the uploading of the video file. Finally, we found that time is a key factor that should have to be taken into account.

7. CONCLUSIONS

In this work we have presented a solution to the problems that virtual universities have to face when dealing with final project dissertations. It is especially difficult to work competences regarding speaking in public or making oral and visual presentations.

The solution proposed consists in that students have to make a video presentation, upload it to a public web within the context of the classroom, and answer questions from the committee as well as from fellow students.

In order to be successful, the problem is addressed from three dimensions: teaching, understood as giving students instructions on how to acquire those competences; learning, understood as how students manage to acquire those competences; and technical, understood as offering students the software they need.

Thus, some documents are given to students explaining how to make effective and efficient presentations (teaching dimension); and a tool has been developed, named **Present@**, that allows students to upload their videos and develop, in the same place, the virtual debate (technical dimension).

From the analysis of the results it can be concluded that:

- Students actually work the desired competences, since in the open questions they highlight the worked aspects, and complain about the stress of answering to partners and members of the tribunal.
- The time dimension should have to be taken into account, since students complain about the amount of time they have to invest to make the presentations; but also complain about the short time they have to enjoy the virtual debate.
- Students evaluate positively the changes introduced in the final degree project dissertation.
- Some technical improvements should have to be introduced in Present@ in the uploading and commenting elements.

From all these items we conclude that the changes introduced in the final degree project actually help students to acquire the competences related with final project dissertation in virtual environments. Nevertheless, some improvements should have to be made, mainly in the technical and teaching dimension.

On the other hand, Present@ has revealed itself as a very useful tool to communicate and we are starting to use it as a video repository in the classrooms where teacher can make short explanations and students can ask questions and address comments about them.

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Nationally Recognized Educational Leadership Program's Blended Learning Redesign

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ABSTRACT

Blended learning is an instructional design that combines face-to-face and online learning [25]. In colleges and universities this design is often referred to as a hybrid model. Colleges and universities are using this design to provide students who have family and work responsibilities a format that increases scheduling flexibility. This also gives the institutions greater use of facilities. The research that has been done indicated that, when designed correctly, hybrid learning increased the students' learning to a greater degree than being spoon fed the information in a traditional classroom setting [12].

This study examines the research and combines that information with surveys of graduate students who are principal candidates to determine the feasibility of changing the total MS Ed Principal's program into a hybrid design. Since the program was already nationally recognized by the National Council for Accreditation of Teacher Education **(**NCATE), great efforts were made to maintain the quality of what was already in place while increasing the flexibility.

Keywords : Blended Learning, Hybrid, Leadership program, Asynchronous and Principals.

INTRODUCTION

Developments in technology, increased student family and work responsibilities, and facility costs and utilization have placed increased demands upon educational environments. Therefore the use of online learning is increasing in higher education. Online learning provides flexible access to content and instruction at any time, from any place; and cost-effectiveness that enables institutions of higher education to address both the needs of the student and the university in 2011. Online learning can increase the availability of learning experiences for students whose schedules limit their face-to-face time availability and also provides universities with an opportunity to offer course content more cost-efficiently while maintaining quality instruction [3]. Online courses are particularly beneficial for the student whose rigid schedule does not allow for the traditional educational approach. The online approach gives students the freedom to work at different hours that benefit both family and work schedules [9].

Within the format of traditional face-to-face classroom discussions sometimes occur with only a handful of students participating while the rest listen or are off task, even discussions that involve the whole class provide few opportunities for reflection. However, online discussions require every student to be engaged and allow for reflection both during and after the discussion [15]. The downside of the total online format is that it eliminates any face-to-face interaction between the teacher and pupils except by appointment during the professor's office hours. Therefore, many colleges and universities are currently adopting the hybrid or blended learning approach in efforts to combine the best aspects of the traditional classroom design with the online design.

LITERATURE REVIEW

Blended learning has been defined as the combination of face-to-face and online learning [25]. In higher education, this definition of blended learning is often referred to as a hybrid model. The goal of hybrid courses isto promote active, self-directed learning opportunities with added flexibility for students [1, 6, 14].

Blended learning in many instances requires extensive course redesign which cannot be designed just to have time spent on line in place classroom time. The goal of the hybrid course is to create more active independent learners. This approach combines both the constructivist learning theory with that of theories of distance education [18]. Therefore, students are able to use their understanding of the material and the feedback of their teacher and peers to formulate their own interpretations.

Research has indicated that when the online format is constructed to enhance the course's instructional tasks it will be as effective as the face-to-face design [7]. Having students learn in a collaborative hybrid format actively engages them in the task or lesson and often causes deeper understanding that includes both content mastery and skill development [13]. Lo, Johnson and Tenorio [14], found that the on-line assignments commanded the students' attention and increased their thinking to a greater degree than being spoon fed the information in a traditional classroom setting. Therefore, the success of a hybrid course is depends upon the construction of the course maintaining its quality and increasing student interactivity and engagement [21]. A course can be composed of a variety of instructional strategies depending upon the goals and objectives that have been established. There is limited research on the most successful strategies for the construction of hybrid courses. In most cases minimum of one to two face-to-face interactions is helpful in avoiding the obstacles that many online courses encounter. Face-to-face sessions provide students with the opportunity to clarify misunderstandings and allows the teacher opportunity to see where possible problems might arise [21].

The hybrid structure also necessitates changing the traditional picture of an instructor. Hybrid courses place less of an emphasis on teaching and a greater emphasis on student learning. A hybrid course causes the teacher to be more of a facilitator than presenter. Therefore, when designing a hybrid course there must be a balance between the activities and the discussions that take place in class and those that occur online. The course goals, measures for student assessment, and class size are also factors to consider in the development of the hybrid course [6]. Since a blended course combines face-to-face and computer based learning opportunities, teachers are able to use a variety of instructional techniques. When implementing an online or blended course the professor must limit his or her involvement in the discussions. Research clearly supports the effectiveness of discussions in which the faculty does not participate directly in the discussion. The instructor may still be engaged, but in a supportive, informative manner outside the primary discussion [15]. Meyer [17] suggested that engaging students in online learning activities will change the nature of the in-class sessions. As a result, the face-to-face sessions shift from lecture to discussion.

Studies [2, 19, 20, 24] indicated that online learning not only enhances the quality of learning experiences but also provides opportunities for a varied community of learners. In addition, research [8, 10, 11, 21] also showed the merits of online learning by focusing on the benefits of asynchronous discussions that are self-reflective and therefore more conducive to deeper learning than the synchronous discussions.

Benefits

Some of the benefits of asynchronous online learning are a student can work anywhere anytime, for one hour a day or for many hours in one day. Students, who have experienced blended learning courses and programs, within higher educational institutions, are generally very positive about their experiences. The principle reason students provide for their satisfaction is the time flexibility provided by a blended format. Garnham & Kaleta [6], found that the students in their study liked being able to control the pacing and location of their learning. They liked the blended design because it provided them with the flexibility to work from home.

The hybrid design also provides students with a much greater range of course scheduling options because of the reduction in face-to-face class time. This convenience of scheduling is increasingly important for the growing number of students who have multiple responsibilities such as work and family commitments [23]. Garnham and Kaleta [6] suggested that students learn more in blended courses than they do in comparable traditional class sections. Teachers responsible for the blended sections reported that students wrote better papers, performed better on exams, produced higher quality projects, and were capable of more meaningful discussions on course material. Spika [22] added that the increased opportunities for self-directed learning in the blended model helped students develop project and time management skills. Blended designs also allow for benefits other than those outlined for the student.

Another advantage of a hybrid course is the utilization of space and time at academic institutions. Colleges and universities are able to handle two times the number of students in the same amount of space. By their very nature hybrid courses combine cost-efficiency with meaningful online learning and without losing the face-to-face student professor interaction [4].

CONTEXT AND STUDY DESIGN

This study was conducted at Monmouth University in West Long Branch, New Jersey, United States of America. The 33 students involved in this study were enrolled in the Principal's and/or Supervisor's program. These programs have gained national recognition through the National Council for Accreditation of Teacher Education **(**NCATE). During the last year due to economic conditions enrollment in these programs has been decreasing. Therefore the university saw a need to re-examine the delivery format as well as the content of the courses that were being offered. Three courses were already hybrid and one was totally online. Prior to changing all the courses to hybrid or online courses I conducted a search of the literature. Much of the research published in relation to hybrid courses relies heavily on personal testimonies rather than quantifiable statistics. Research conducted at the University of Wisconsin-Milwaukee, details the instructors experiences creating and teaching hybrid courses. Concerns were raised regarding the lack of teacher-pupil interaction, limitations of large classrooms, and restrictions upon the learning environment due to time constraints [12]. Johnson [12] also reported that utilizing hybrid courses, though beneficial for the student, involved significant planning in order to make the hybrid format successful and was very time consuming for the teacher. Despite these findings Johnson found that the hybrid design was very successful.

In order to gain the students' perspective, I also surveyed those students who had already taken at least two of the hybrid courses and the one online course by using parts of a survey conducted by Castle and McGuire [3].

RESULTS

For the purposes of this study I focused on the results obtained from five questions. The questions and the results are listed in Table 1.

Table 1 Student Satisfaction in Hybrid Courses

Question	Agree	Disagree	No Opinion
1. I can control the pace of my own learning.	31	2	

2. I can organize my time better.	33		
3. The time I spent on-line would have been better spent in class.	3	30	
4. I prefer the asynchronous design.	33	0	
5. I prefer the hybrid courses over In-class or on-line courses.	30	3	

As is evident from the results, the students overwhelmingly indicated that the asynchronous hybrid design was preferred over the weekly in class sessions or the total online approach. The students were also asked to provide additional comments. Since many of the comments were similar only some of the responses are listed below.

Student A - *I have many family responsibilities, as well as, a full time teaching job; the hybrid courses gave me an opportunity to advance educationally and still be available at home.*
Student B - *As a graduate student, the asynchronous design let me do my assignments at any time. However I do like the idea that there were specific due dates that forced me to stay focused.*
Student C - *As far as the online Curriculum Development and Design course is concerned, it is the only course that I can see being totally online because it is primarily focused on field experiences in your own school and the evaluation of other colleagues classroom setting and delivery of instruction.*
Student D – *While I don't mind the hybrid course design, I still like the regimen of coming to class each week. I know that there are opportunities to dialogue during the times that we are not in class but I still like that weekly face-to-face contact*.
Student E – *I not only work fulltime as a teacher but I also have coaching responsibilities during each season. The hybrid courses enabled me to still work on my Master's degree in Educational Leadership while fulfilling those other responsibilities.*
Student F – *I think the hybrid courses provide the best of both worlds: face-to-face and online.*

PROGRAM DESIGN

All of our courses in the MS Ed. Principal's and Supervisor's Program are designed around the cooperative learning structure. We believe that the candidates learn as much from their peers as they do from the experiences of their professors. So it was important for us to make sure that we did not lose that design in our online blended format. Therefore, cooperative learning was used in all of our hybrid courses as an effective way to engage all students. Online asynchronous small group work allowed students to meet from any wired location according to their own schedule. Online discussions and cooperative learning strategies significantly extend and enrich the learning context of the face-to-face classroom and provide many opportunities to learn from each other. These techniques, when incorporated into our hybrid courses enhanced their abilities as school leaders, their team building skills and their individual responsibility.

All of our courses have well defined rubrics as examined and assessed by NCATE and the Educational Leadership Constituents Council (ELCC) Standards. Therefore it was only necessary to verify that the student postings would also be assessed by a well-defined rubric. Our local results, combined with the research, the students' responses, and the strategies and assessments that were already in place gave us the impetus to change all but one of our courses to the hybrid design keeping the remaining course, Curriculum Development and Design, as an online course.

CONCLUSION

The future of hybrid or blended learning has no boundaries due to the constant development of new technologies. Increasing costs of maintaining university facilities, abundance of mobile devices, and growing demand for sophisticated learner-centered technologies are creating excellent conditions for hybrid and online learning as the norm in higher education [25]. As the future of hybrid and online learning progresses, expectations regarding higher education will also increase due to the opportunities to offer this education in a flexible, asynchronous format [5].

In order for hybrid and online learning to occur effectively, instructors must constantly upgrade course content, carefully create online discussions that support learning beyond face-to-face course time, and incorporate cooperative learning groups using research-based process and structure so that students gain a greater understanding of the leadership skills necessary to be a school principal or supervisor [15].

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Keeping Up With the Reality Show: A Ten-Years-Later Review of Surviving Teaching on the Internet

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Submitted to:
(6th) International Multi-Conference on Society, Cybernetics and Informatics: IMSCI 2012
2012 Conference on Education and Information Systems, Technologies and Applications
Track:
Education and Informatics e-Learning
e-Learning
Presentation: Paper

ABSTRACT

A dozen years ago, I set out to teach my first Internet course at York University, a large urban Canadian university with 55,000+ students who are mainly commuters. Two years later I wrote an article titled, "Survivor!: When the Next Reality Show is You Teaching Your First Internet Course", in which I argued that there are ten major things you should not do when teaching on the Internet. Now ten years later, in this paper I revisit those recommendations to see if they still hold true, and to see if we need to add any new ones.

INTRODUCTION

Even ten years ago, there already were literally thousands of academic articles, magazine stories, newspaper items, handbooks, texts, workshops, entire courses and degrees on the subject of teaching online. In this article ten years later, I have not updated the bibliography but include the sources from the original article.

I teach Marketing in the undergraduate business programme of the Faculty of Liberal Arts and Professional Studies of York University, a large urban university whose 55,000+ students are mainly commuters. For many years I had resisted Internet teaching. The term *resist* is perhaps too polite. As head of the Marketing Area, veteran of a quarter century of teaching experience, and holder of a treasured teaching award from the alums, I had steadfastly refused to condescend to teach on the Internet. I cited among my many reasons the fact that while a straightforward numbers course like Accounting might possibly be transferred to web pages, surely a Marketing course would need the teamwork and interpersonal interaction that is part of a traditional classroom in order to continue to be the exciting worthwhile phenomenon that we want our students to experience and I questioned how that could possibly be accomplished online.

I owed a favour to a good Dean, however, and in a moment of weakness, when pressed to teach the introductory Marketing course on the Internet so we could promise our students the possibility of taking the entirety of their business degree online, I agreed to create and teach not one but two Internet courses. Not only had I never taken or taught courses on the Internet, but neither of these courses had ever been taught outside a traditional classroom by anyone in our university. There were fellow pioneers in other disciplines, and I began to talk to anyone who had taught anything on the Internet. I went to every workshop I could find, read dozens of books, journals, and magazines, searched the Internet and read online, and experienced increasingly serious attacks of panic wondering into what bottomless abyss I had unwittingly stumbled.

I succeeded in my online teaching, thanks to a number of helpful colleagues who had gone before me. I wrote an article about it for a journal, titled, "Survivor!: When the Next Reality Show is You Teaching Your First Internet Course". I include a link to it in my university web site so students and other faculty can read of my experiences. Now, it is time to update that article and see if those ten rules are still in force and what new ones we might add. I have summed up the initial advice in italics.

TEN THINGS NOT TO DO WHEN TEACHING AN INTERNET COURSE

1. Don't Ignore the Advice of People Who Went Before You

Even when someone tells you directly that something will be a problem in Internet teaching, being accustomed only to in-class teaching, we may not give enough credit to their warnings.

Even after teaching Internet courses and dealing day to day for years with the problems that arise from their dissimilarity to on-campus courses, I find it is easy to forget that indeed Internet courses are different. This paper addresses some of those differences.

2. Don't Expect to Hear Consistent Advice

Different faculty will always have different experiences with teaching. One colleague will suggest doing all your own programming while another will insist you leave it to the computer experts. Listen to everyone and choose what works best for you and your students.

One major thing that has changed in a decade of online teaching is that more universities and professors are doing it. With that comes more help available in a myriad of places. Many universities now have an entire technical department devoted to online teaching, with experts in a variety of areas available to help by email or telephone. Builders of platforms for hosting Internet courses offer consistent frameworks for Internet courses so we may find help from a colleague even though we offer substantially different courses. Don't be afraid to experiment; almost anything can be done online. You may be working with something no one else has tried, or you may be teaching a course that has been online for many years but is open to change. There are always alternative ways of doing the same thing.

3. Don't Leave Preparation until the Last Minute

We are often warned about procrastination, but many of us ignore the warning, preferring the rush of the last minute deadline to inspire us. I had planned my schedule for an intense winter term but with only these two courses to develop. I soon realized it was imperative that I have the entire course complete and online on the first day of classes.

This simply does not always apply. I have known faculty who have been given notice in August that in September they will teach a new Internet course. When this happens, you can only do the best you can and make some adjustments such as planning to have students do the material in more synchronous time. Many platforms such as WebCT and Moodle today allow you to highlight only those units that are open to students, keeping the remainder hidden, and allowing you to work on new units as they come up. The main thing lost is the students' ability to work through the material at their own pace, but it does not have to spoil the course.

4. Don't Let the Course Take Over Your Whole Life

Many experienced Internet professors tried to impress on me how easily an Internet course can take up every minute of your day if you are not careful. I listened to this advice with only half an ear because I was accustomed to the fact that teaching, a career I loved, takes a lot of time.

This is still a crucial point. About five years into my Internet teaching experience, I realized I had failed completely to listen to this advice and had done nothing to help alleviate the problem. I even went to teaching conferences and was arrogant enough to insist that the professor must be there for her students, always, and how even though it takes time, it is worth the effort to read each posting, not only for responding to the student who wrote it, but also for what I learned from my students. Don't plan to work twenty-four hours a day seven days a week. Try to set specific days and times when you will work on the course. If there are funds or course-release time available for preparation, equipment, tutors, or technical help available, use it. I no longer attempt to read every posting. I had developed a system where I go through the postings each day and try to answer those that are new that day, but there are times when even this is impossible. I have tried dividing the class up into large groups (100 students divided into four groups), and this gives them a chance to be read more often by their other group members. I then try to answer a few in each group.

5. Don't Make Extra Work for Yourself

Don't try to do everything yourself. Don't give students a trout but rather teach them to fish. Don't be a mother hen about enrolment, assignments, etc. Don't spend too much time on the 20% who cause 80% of the problems. Use technology to advantage.

This still stands as an important rule. Do not make more work for yourself by trying to do too much or taking on responsibilities that belong to someone else. The fact that an Internet course may easily take up to three times as much work as an on-campus course is now a concern for many faculty unions in negotiations on workload. There are few easy answers, but there are some. The first is to try if at all possible to ensure that in your first Internet teaching experience, you are converting an already existing course rather than trying to invent a course and simultaneously create it for the web. Although I

previously emphasized the importance of encouraging students to find things on their own, after years of teaching Internet students I believe it is better to give them an answer, albeit short, with reference to further information and where to obtain it. Most of them are appreciative of a short quick answer that does not entail their going on a time-consuming search; they can proceed with their work. Do not, however, back down on rules you had decided were important; every rule you allow a student to break is guaranteed to cost you time. Encourage truly troubled students to access the Counseling Centre.

6. Don't Try to Create an Internet Course by Just Uploading Current Course Materials

Don't think you can create an Internet course just by uploading your teaching notes or by videotaping yourself speaking in a regular classroom. Be aware of copyright rules; things you used in the classroom may not be useable on a website.

This still stands as a crucial point. Your Internet students deserve better than second-hand material. Use the Internet as it was intended to be used. Make use of design, colour, white space, pictures, clip art, URLs, other sites, links. Put what you want them to get from you into website-structured pages. Find new sources of copyright approved visual materials through your textbook publisher.

7. Don't Expect More from Online Students

Don't expect Internet students to read directions or instructions any more carefully than regular students.

I expected much more of my Internet students. Anyone capable of taking an Internet course, I believed, would be fantastically bright and capable and able to avoid all the pitfalls into which my on-campus students fell. They are still at heart the same students you have known in the classroom, with the same needs and shortcomings, and perhaps more needs. Try new ideas such as video stream for important sections, or a series of PowerPoint slides or audio instructions with still-photographs to illustrate a difficult concept. Most important to note is that Internet students still need deadlines. I also found that Internet students do need a little more care and attention than traditional students. It does make a difference that I am not with them in a classroom, in person. It makes a difference that they cannot see my face, my smile, the subtle nuances of body language when I write something in the way of recommended or forbidden actions.

8. Don't Underestimate the Power and Problems of Technology

Don't assume the technology will work. Secure the equipment you need. Learn as much as you can about the technology. Don't take the "my dog ate my assignment" equivalent of excuses. Plan and design simply.

Much of this has changed. You now can rely much more on technology to work correctly, and it will alleviate the need to learn technical details. It is far easier to design clever original creative web pages than it used to be, and our students, masters of incredible skills in technology, want pages that excite them. Recognize that computer age dogs do still eat computer age assignments, in ways that regular dogs would never have imagined. I now, for example, assign a paper due at 7:00 p.m. on a Monday but do not pick it up until Tuesday afternoon, taking no note of when papers come in. When a few students run into problems posting and write me, I just tell them, don't worry about it.

9. Don't Lose Yourself or What You Stand For

Don't neglect your own needs. Don't try to be someone online who you are not. Don't waste time defending yourself and your policies; just put it in the course kit and cite it. Don't go too soft on them just because you feel guilty about not being in a classroom for them. Cut them some slack because Internet is different, but don't let them get away with too much. Avoid expressing annoyance, even if the question seems stupid or arrogant. You'll regret it when you see them in person at the test.

Although I start this paper advising you to listen to anyone who has done this before you, and despite what I have just said in the paragraph above, do not try to duplicate what others do. Teaching is very much a personal calling, and we all do things differently. Do what works for you. I found in my first few years of Internet teaching that I was letting students "get away with" things I would never have tolerated in an on-campus classroom. I believe in setting simple rules and insisting they be followed. I let this go for a while and it was not good for the students or for me. Today, Internet courses are fairly common and it is easier to insist that students comply with the rules.

10. Don't Forget to Have Fun

I love the flexibility of Internet teaching. I love the creativity of designing and maintaining the website. I like not having to be on campus at 10:00 p.m. on an icy February night. But most of all I love the closeness with students that I did not believe would be possible in an Internet course. I find that students are often more forthcoming and willing to "talk" on the screen with its relative anonymity than they would be in an on-campus classroom with 150 students.

This is still one of the most important recommendations, and I believe I did not recommend it highly enough at the time of the first article. With years of experience in Internet teaching, I recommend highly that you try to relax and to enjoy all that can come out of an Internet course. I have found that I still get to know students well enough to write them letters of recommendation for graduate school or jobs, that I can sense when a group is having a problem, that I still know their personalities and sometimes even recognize their writing styles. It is not only possible to do group work, on which many business courses depend, in an Internet course, they are already doing what many students in on-campus courses have been doing for some time, and that is meeting electronically. It helps with the difficulty of coordinating group work in today's university climate where so many students are working part or full time to be able to afford to attend. And it emphasizes a method that is used in most businesses today to link people with varied schedules at the same time. I also have found that students come to know each other fairly well, especially if you take the time and effort to put the class into smaller discussion groups (the caveat being that this will make more work for the professor who tries to interact with his/her students). But the rewards are worth it. One summer we all received baby pictures from a student who was pregnant during the winter term Internet course.

THREE NEW THINGS NOT TO DO WHEN TEACHING AN INTERNET COURSE, TO MAKE A BAKER'S DOZEN RECOMMENDATIONS

11. Do not take lightly the difference for students between synchronous and asynchronous courses.

Although I have done almost everything in asynchronous time, synchronous meeting time has a real appeal. You are all together at one time, just as you are in a traditional classroom and you can be assured that everyone is receiving the same message at the same time. But many students take Internet courses specifically for the lack of having to be somewhere at a specific hour. There is also the issue of time zones. In one course in one year, I had a student each from France, Egypt, Saudi Arabia, Georgia, and a lumber mill 2,500 kilometres north of Vancouver. Try assigning some of the work for individuals to do on their own time and some time to be all together, for such things as holding a question and answer period before a test. Warn them of parts that require synchronous work, with alternatives for those far away. I also have found it beneficial to close down earlier unit discussions as you move forward in the course. Too many students will keep returning to the part they know already, and some will delay starting the course work until nearly the end because they figure they have the entire term to catch up.

12. I have said that you should not agree to teach on the Internet a course you have never taught before. This has changed; it does happen, and there may be nothing you can do about it. It can actually be beneficial to start with a clean slate, building your website from the ground up in the new medium, instead of trying to change materials originally designed for on-campus teaching into materials appropriate for the web.

13. Do not think that keeping track of the level of participation will be easy. In order to encourage good participation in the online discussion group, it is necessary to have some marks allotted to it. Usually a simple count of messages posted has been all I have been able to do, in the beginning doing it student by student. I then found WebCT which counts messages posted. This is not ideal, since many students catch on quickly and start posting tiny little messages like, "I agree" and thereby upping their count. It is not possible to read through all messages and give a mark, nor is it even feasible with large classes (I have 100 in a class) to choose any number of postings. I have had some success with asking students to send me their three best postings, giving them the opportunity to help in their evaluation. But now that we are using Moodle, there is not even a mechanism to count postings. Any suggestions here would be most welcome; please write me at lripley@yorku.ca.

CONCLUSION

I had been teaching and living a fairly fearless life for a quarter of a century when I was asked to teach my first Internet course and I was scared to death. But I remembered what I always tell my students: the best solution for fear is to be as prepared as you can be, and to talk to others who are going through similar experiences. Some basic questions remain:

How do we appear to our students as we would like them to see us when they cannot see us? We mostly do this through our own postings that students read. You might be amazed at how clearly your personality, preferences, and quirks come through your written words, and this can be a valuable lesson for students. I am hoping that having to answer a question on the final exam about a posting regarding Dr. Seuss, taken directly from the discussion board, may encourage students to keep their sense of humour and their attention to the words of others when they become managers.

When students cannot see our faces, how do we strike the right balance between coolly professional and warmly caring, between precise technology and errant humanity, between the "I-mean-business" guy and the approachable professor, all these dichotomies that are important in any classroom but crucial on the Internet?

We do it by using technology to bring into the classroom the same care and concern for our students that we have always had. It is amazing what you can find on the Internet to put into a website that conveys your personal message as well as your academic one. We do it by knowing what we believe is right and proper and what we think does not belong in a classroom (my students are never allowed to make fun of each other). We do it by recreating in the Internet course the same fun, the intimacy, the spontaneity, the human element that we use in the on-campus classroom. It will just take thinking outside our comfortable boxes.

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E-curriculum Projects in Hungarian Higher Education: A Case Study

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Introduction

The paper is concerned with e-curricula recently completed by two Hungarian higher education institutions, jointly funded by the European Union and the Hungarian government. I will arrange what I am going to say around seven main topics. I) A brief introduction to Hungary's EU accession to the European Union as well as II) a brief look at Hungarian internet infrastructure will come first as antecedents. III) Related section of the EU project system will follow to show how EU projects work. IV) The basic aspects of SROP's (Social Renewal Operational Programmes, "TÁMOP" in Hungarian) will be detailed. The four introductory sections will lead up to e-curriculum projects in Hungarian higher education. So, V) I will turn to the e-curriculum in general and VI) to the e-curricula of two 4.1.2-08.1/A-category SROP projects in particular, from the point of view of teaching technology. (Lack of space will permit me to detail with one of them only.) VII) Some concluding thoughts about application and effectiveness will close the paper.

Keywords: case study, e-curricula, EU-funded projects, Hungarian higher education, blended learning

I. HUNGARY AND THE EUROPEAN UNION

Following the tremedous social changes of 1989-90, the former so-called socialist countries, with Hungary among them, targeted joining organizations of West European integration. As a result, my country has been a NATO member since 1997 and joined the EU as a member country with full powers on May 1, 2004. [1]

II. AS FOR HUNGARY'S INTERNET INFRASTRUCTURE

Hungarian Post, Hungarian Telecommunications Company, and Please Ltd. started building a packet-switching network as part of the Information Infrastructure Development Programme in 1986 (in what was still socialist Hungary). The two sponsors of the program were the Hungarian Academy of Sciences and National Technical Innovations Office. Because of import restrictions, the Academy developed a huge, "home-made" area network of a software system for Hungarian users. The network was in place by 1990, with thousands of X.25 terminals. It offered network services for research institutes, universities, and libraries. 1990 was the year of international opening in my country: through EARN-BITNET and EUnet a Hungarian internet system of full value was built through Vienna. HBONE, backbone network using IP technology was created parallel with this development. In 1991 HUNGARNET, the National Information Infrastructure Development Institute was formed. In 1993 the first Hungarian server, www.fsz.mne.hu, went into operation, and HUNGARNET joined the European research network center DANTE (Delivery of Advanced Networking Technology to Europe) as a founding member. [2]

III. HOW EU-FUNDED PROJECTS WORK

Projects work as regulated by the EU support system, based on the same principles in every member state, as approved and monitored by Brussels. The previous cycle was spanning the

years 1996-2006, and the life-time cycle of the present one is seven years (running from 2007 through 2013). Project applications are invited in full accord with Brussels basic principles (with EU legislation and regulations), with their contents determined by the given member state. In our case they are announced in Hungarian, and the budget of the project is calculated (and handled all through) in Hungarian forints. [3]

IV. THE SOCIAL RENEWAL OPERATIONAL PROGRAMME

SROP is one of the most important sectoral programs of the New Hungary Development Plan (NHDP). When I summarize what can be reagarded its essence in the present context, it is my intention to stay close to the document itself, by using direct and indirect quotations.

The purpose of the Programme is "to implement interventions successfully in the programming period 2007-2013, which affect the entire population of the country, based on the infrastructure background, equal chances of access to quality services provided primarily by the Social Infrastructural Operational Programme and regional operative programmes."

The budget of the programme: 85% of its funding is provided by the European Union and 15% comes from related domestic sources.

The programme's set of objectives: the contribution of the Social Renewal Operational Programme to NHDP's overall objectives of the expansion of employment and permanent growth primarily is "by measures aimed at the supply side of the labour market" and "through the development of human resources." SROP maintains that in order to exploit available labour supplies, job-seeking must be increased, labour market and social discrimination decreased. It is also necessary to improve "the harmony between qualifications, skills sought and supplied."

"The above objective is intended to be achieved with the improvement of the quality of human resources and with the implementation of the following specific objectives, which requires both the instruments of employment, education and training, the social field, health care, culture and general education, and anti-discrimination instruments".

- Improving the alignment of labour market demand and supply; reducing the regional differences in activity; promoting adaptability to change; promoting lifelong learning; improving the state of health and ability to work; strengthening social inclusion, promoting equal opportunities [4].

V. SROP – 4.1.2-08/1/A

The project was initiated in 2009, to be funded by the EU and co-funded by the European Social Fund. Its main purpose was curriculum development and content development, with special regards to training programs in mathematics, natural sciences, technical disciplines, and informatics.

The main objectives of this SROP priority axis are: to change over to competence-based education; to switch curricula and curricular contents to the requirements of the recently introduced linear Bologna structure of higher education; to give information and communications technology a wide currency, thereby enhancing ICT-competence, adopting lifelong learning strategy, and moving in the direction of massification of higher education. The rapidly increasing amount of fast-changing knowledge makes it imperative to develop and employ complex and up-to-date higher education contents, programs, and methods.

The construction aims at providing higher education institutions with the opportunity to prepare themselves for meeting the demands

that follow from the Bologna Process, the European Qualification Framework (EQF), the strategy of lifelong learning; also to renew and expand training capacities through curriculum development and related content development.

What is more, it also intends—in agreement with the Lisbon Strategy—to facilitate the development of state-of-the-art training programs in the fields of mathematics, natural sciences, technical sciences, as well as informatics and computer science; to contribute to increasing the proportion of students and graduates in these fields by developing and disseminating up-to-date curricula and training methods.

Allocated funding at the time when the project was announced: HUF 1 713 043 848, an amount secured in co-financing by the European Social Fund and the Hungarian Republic's budget.

Content of application

1. Curriculum adoptation, curriculum development, content development activities

- Purchase, translation and adoptation of international curricula used in foreign higher education institutions and training programs; developing interdisciplinary and complex curricula; harmonizing curriculum development with expectations of the labour market, involving actors of the labour market in curriculum development; switching from print-based content to digital content, developing digital training program; building foreign language credits in curricula, developing bilingual degree programs; developing foreign-language degree programs; translation of foreign language curricula into Hungarian and Hungarian curricula into a foreign language; development of complete curricula, especially modular ones; drawing up curriculum grids, allocation of credits to content; revision of credit allocation, harmonizing institutional or disciplinary credit content; developing institutional chart of credit equivalence; securing free online accessibility of most frequently used academic textbooks; content development related to sustainable development, social responsibility, climate change, equal opportunities, health development, consumer protection, and labour conditions.

2. Modernization of content services

- Making offline contents accessible online; creation of related OpenCourseWare (OCW), open-course sharing; designing online accessibility for traditional knowledge- and information-based disciplines; upgrading existing own sites providing content services, in relation to the curriculum development and content development described above.

3. Acquisition and improvement of specialized scientific databases aiding curriculum development, content development, and training.

- Acquisition of curriculum and content development-related scientific databases; integration of above databases into curricula.

VI. THE TWO SROP-SUPPORTED E-CURRICULUM PROJECTS

SROP 4.1.2-08/1/A-2009-0005

Project title: "OpenCourseWare informatics curriculum and SCORM compliant curriculum development in a BA/MA-level linear degree program framework of library informatics."

The application submitted in 2009 was a winner in 2010. The Ministry of Education provided a

68.504.114 HUF support. As the total project cost was 85.630.143 HUF, the nearly 17 000 000 HUF needed for launching the project came out of the participating institutions' own budgets as own recourses. Members of the Consortium: Károly Eszterházy College, University of Szeged, University of Western Hungary, and the College of Nyiregyháza.

General objective: to reach out beyond the walls of these colleges and universities to make adult education of the region more effective and raise the level of training and education. It is another step in the process of introducing various forms of e-learning in all these institutions. The idea was to implement a system which could be used in the whole spectrum, day-school and corresponding courses alike, as a complementary support of individual study. In the project under discussion the basic and core training contents of bachelor and master's level librarian and information scientist training were developed as determined by training and exit requirements and adapted to the electronic learning environment (preparation, medialization, Scorm-compliant publication). The project produced 42 multimedial curricula, with fifteen hundred pictures and hundreds of sound and moving picture components as illustrations, all made available online. The whole material is public and available on the web at http://www.tankonyvtar.hu/

The steps in creating the project:

- creating, building up, and operating the work-surface;
- preparation of project participants, clarification of their roles, their introduction to working processes, presentation of indicators;
- definition of quality management directives and aspects;
- development of source-documents that comprise the curriculum, and their uploading onto the work-surface;
- converting core package of the curriculum to SCORM 1.2 standard, fitting ready media elements in the e-curriculum, completion of SCORM - standardized software;
- steps related to professional review of e-curricula;
- finalized curricula are transferred onto the learning management system (LMS);
- publication at www.tananyagkonyvtar.hu .

1. The work-surface: the eProjekt (http://eprojekt.ektf.hu) page is a shared surface, which makes interoperability of relevant documents possible for the project management.
2. Preparation of poject participants: it takes place in several phases, according to their spheres of action.
    - Professional requirements: faultlessly produced core material; didactic stratification; typographical freedom depending on professional criteria; tests; media elements (exact element numbers are important); scenarios; a clear sense of evaluation criteria; acceptance for production

3. Quality control: the project is steered by clearly defined principles and aspects of quality control.
4. Preparation of source documents and uploading them on the site; determination of media formats.
5. Media components: creation of scenarios for pictures, figures, videos, and animations that are needed for the curriculum.
6. Conversion of core material to SCORM 1.2 standard, fitting ready media components into the e-curriculua.

Didactic structure:

- sections of the introduction comprise: main purpose, content, succint exposition, definition of competencies and requirements, learning advice, general information; lesson (core curriculum); summary/conclusion; supplements

The e-materials were constructed with LMS, which makes it possible that besides the SCORM 1.2 format, one can generate, out of the SCOM packages, the XHTML version of the curriculum, for whose running no SCORM player is needed, only a browser, which is especially advantageous in case of offline display.
eXe e-learning editor was also used in the course of the work.
Use of training management (framework system): MOODLE is the most commonly used in Hungarian higher education. It was employed in this project too.
7. Official reviewing. It was undertaken by consortium faculty before finalizing the e-curricula.
8. The finished curricula were then transferred onto the LMS.
9. Publication on the www.tankonyvtar.ektf.hu web page. [5]

SROP 4.1.2-08/1/A-2009-0046

It is the project of the Faculty of Informatics, University of Debrecen. 47 e-curricula were generated at 95 million HUF cost (most of it generated through applications). The 47 e-curricula were constructed under the umbrella of the ”Information science curriculum storehouse.” The program participants were University of Debrecen Faculty of Informatics as well as the faculty of partner institutions, 60 in all. The length of time the project required was a year and a half. The developed curricula cover the participating institutions’ whole range of information science training: software information technologist, business information management, software engineering, library information sciences, and informatics training at BSc and MSc levels. They also purchased and adopted curricula from international higher education institutions, digitalized several books, which they will make accessible online free. They laid special stress on harmonizing curriculum development with the demands of the labour market, so they invited the professionals of the region’s relevant firms to participate in the project. The digitalized contents will be made available on web page http://www.inf.unideb.hu/kmitt/konvkmitt/ in printable or browsing html format, and as epub for e-book readers.

VII. THE EFFECTIVENESS OF E-LEARNING

The role and effectiveness of interactive, multimedial curriculum in the complex process of learning gains more and more recognition. Learning combined with e-learning is a forceful combination of our days. A significant development of recent years is the extent to which blended-learning methodology is gaining ground. It points beyond the classroom as it is both technology-based and human-being-centered, individual and collective, guided and discovery-oriented. [6] It is a blended form of learning, in which part of the learning environment keeps changing in time and space, and learning will not be space-dependent.
The e-curricula introduced above are out to support blended-learning. Eszterházy College has already established its own tradition of e-learning-supported instruction. They launched the long-distance education variant of librarian and information scientist training in 2000. The curricula developed in that early phase, also financed by application-generated funds of the time, are somewhat outmoded by today, and the introduction of the Bologna structure made them obsolete to some extent. The SROP project e-curricula were already developed in such a fashion that they adjusted curricular content to the employer’s demands, and gap-filling courses were created. Careful analyses resolved into the conclusion that “blended learning” would be most expedient to introduce, whose components comprise traditional learning, virtual learning, e-curriculum, and personal consultations. [6]

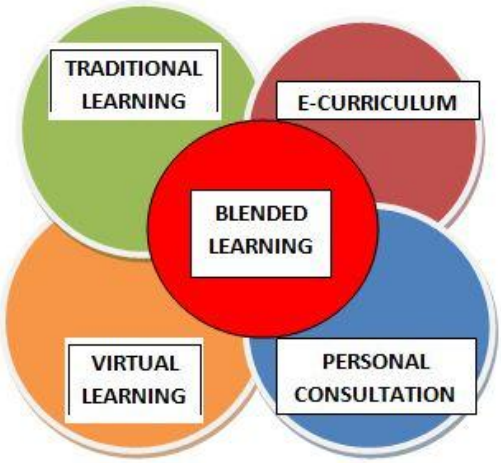

Figure 1. The elements of blended learning [6]

The theory and practice of learning has never been uniform. It was usually divided into three areas with different actors: theory, education, and business. The learning habit of the Z-generation of our days is changing as we speak. "Digital natives" demand teaching and learning methods that exploit the possibilities of information and communications technology increasingly and more extensively. Z's are quite happy sitting in front of the computer for hours, something our pedagogy must make the most of. Old methodology and old learning content are replaced, cooperation, interactivity, visuality, and playfulness are foregrounded. Contact-learning environment, where individuals are simultaneously present in person in space and time can no longer be effective in itself. Changed attitudes are a huge benefit: the student's command of information and communications technology becomes systematic and exploitable—emerging here is a 21st –century key competence: media erudition. One thing Hungarian higher education tries to do is to respond to the changed world of changed learning habits. Monitoring and assaying the results of the new teaching and learning methods is a challenge for the years to come.

Summary: e-curricula can be used efficiently only if they fit into the blended learning framework. What remains an open question, though, is to what extent the availability of e-curricula bears on students' disciplined class attendance. In Hungary students are not required to attend a lecture course (as opposed to seminars and practices); therefore, e-curricula may increase the number of classes in whose case student attendance has never been characteristic in the first place. The only way to avoid the situation getting worse is to assign the e-curriculum a role in which it represents only part of the knowledge to be acquired.
Nevertheless, on the whole, the SROP-funded e-curricula, on the point of being implemented, offer students and faculty technologies that can be effective since they are a state-of-the art response to a highly contemporary challenge.

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Enhancing Classroom Instructions Through the Application of Bluetooth Technologies. A case of Schools in Kenya

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ABSTRACT

The Information Communication and Technology (ICT) revolution has led to data to be accessed on line or off line. Technology has made the world a global village where people communicate to each other effectively and efficiently regardless of their locations. It is clear that the communication landscape has changed and this change has infiltrated the school system being an open system. Bluetooth is an open wireless protocol for exchanging information and data over short distances from fixed and mobile devices. This technology if well integrated in our classroom settings can improve the efficiency of classroom instructions by the teachers. A case in point where this technology has born some fruit is a primary school in Kilgoris, Narok County in Kenya where students can access all the library books through their small PC gadgets called kindles, the students in this school enjoy learning and access to educational materials is not only enhanced but also improved. Currently, most of our teachers are still using the traditional methods of instruction that is, chalk and board against the use of digital devices like overhead projectors, laptops and PC tablets and Kindles. The situation is further aggravated with increased enrolment in both primary and secondary schools due to the governments' free primary and secondary education policy. This has made classroom instructions tedious to many teachers and learners are not quite involved in the learning process. This paper therefore seeks to explore the integration of Bluetooth technology to enhance classroom instruction by:

i) Analyzing the difficulties facing current classroom instructions.

ii) Examining how the Bluetooth technology can be integrated in a typical classroom instruction set up

iii) Investigating the application of Bluetooth technologies in classroom set up.

iv) Analyzing the challenges facing the adoption of Bluetooth technology in typical classroom.

Key words: Bluetooth Technologies, Classroom instructions,

Introduction: The Information Technology (IT) revolution has led to data to be accessed on line or offline. Technology has made the world a global village where people communicate to each other effectively and efficiently regardless o their locations. It is clear that the communication landscape has changed [1] and with these changes, we have witnessed dramatic shifts in the way young people make meaning from texts of all kinds such as the multimodal texts. Multimodal in the global context is the communication in the widest sense, including the graphical, digital, electronic and artifact related. [2] argued that learners need a far wider range of affordances for meaning making in schooled settings and multimodal communication is a lens for understanding meaning by learners as it stretches out meaning.

With the advancement in technology, there has been need to digitalize learning systems. One of the tools being used in for this purpose is the "Bluetooth technology". This technology allows the scope for interact ants to connect with the likeminded others to feel the camaraderie of shared interests, to identify and solve problems in a collaborative approach and to experiment with ideas and ways of communicating. The authors are particularly indebted to those who have demonstrated the potential and use of Bluetooth technology in relation to its application in the education environment.

The use of technology in a classroom set up has various merits. Students learn at their own pace getting essential skills and knowledge and this helps to bridge the social gap amongst students. Students get enough time to practice with and without the teacher's support, as they get involved in the learning process with their peers. They also have an opportunity to apply skills and strategies in reading and writing meaningful text. Care should however be taken when students are exposed to this kind of technology. If not well regulated, some students may get so much involved with the new devices and not the content and new concepts they ought to learn with the assistance of this technology.

Difficulties teachers face during classroom instructions

Traditional methods of instruction which relied on oral discourse and verbal comprehension have proven ineffective for many students and are not cost effective. The methods no longer coincide with or meet the modern technological needs or nuances of the society.

The teacher has the responsibility to help the learners feel and be successful. Students often get bored and less interested in their school work. Some get bored during the instructional process and even doze in class since they are passive listeners. The learning process through school academic tasks and concepts become increasingly more abstract and many of them fall further behind because their level of mastery may be too rudimentary to allow for fluent learning. Facilities in most schools are quite inadequate vis a vis the number of the students currently enrolled for both primary and secondary education as a result of Free Primary Education policy introduced [2]. This policy saw

many learners scramble to schools to get the subsidized primary and secondary education, this left the few resources available in these schools overstretched and the problem of teacher shortage has persisted since then. Currently there is a shortfall of 76,000 teachers in both the primary and secondary schools in Kenya [2].

Some schools group students according to their ability without considering their individual differences. Ineffective instructional groupings where slow learners are mixed with fast learners and where instructional processes are outdated are common place in a typical Kenyan classroom. The task of delivering effective instruction and related services to a larger number of students are more difficult in such a classroom. Teachers face various discipline problems affecting delivery process especially where the teacher is the main contributor and students are mere passive listeners and observers. Similarly, some of the resources used may not be well adapted to the needs and abilities of the students for lack of innovation and interest.

The traditional classroom layout makes the amount of work space inadequate for students. The chalkboard in front of the classroom and sometimes others are at the sides or back forms the main teaching resource. Instructional delivery is a vital classroom activity and must be considered in the context of such factors as measures of desired student behavior and considering individual differences.

Integration of Bluetooth Technology in Classroom Instruction: Since students are well versed with the use of electronic devices in their everyday life, teachers must learn how to integrate this new electronic culture in teaching and learning. Currently, there is integration of technology to enhance the performance of teachers and learners during the learning process. The technology does not replace the teacher but helps him / her do a better job. The idea is that by showing students the content and processes every day, teachers also get to learn more by receiving constant reinforcement of ideas they have taught.

Instructional technology is based on using modern electronic communication devices like VCR, audiotapes, computers and electronic bulletin boards. These present a new resource which makes instruction comes alive in the classroom. Students assume responsibility for their own learning especially if the material presented is stimulating. [3] and his colleagues have shown that combining visual contents greatly increases learning and retention. Students also learn best when they control the rate of learning though participation and involvement. The latest pedagogical tools from technology permit teachers to customize instruction to the needs and pace of individual students. Students do not need be near the teacher for instruction to take place. One of the tools used to enhance effective teaching and learning is the Bluetooth technology.

History of Bluetooth Technology: The name Bluetooth comes from King Herald Blaatard (Bluetooth). A Danish who lived in the 10th century AD. He had dark hair thus the name Bluetooth meaning dark complexion. He brought Christianity to Scandinavia along with the unifying of Denmark and Norway. Bluetooth is an open wireless protocol for exchanging data over short distances from fixed and mobile devices, creating Personal Area Networks (PAN). It can connect several devices overcoming the problem of synchronization. Its protocol stack allows devices to locate, connect and exchange data with each other and to execute interoperable, interactive applications against each other [7].

Bluetooth Basics: The key features of Bluetooth technology are robustness, low power consumption and low cost. A fundamental Bluetooth technology has the ability to simultaneously handle both data and voice transmissions. This enables users to enjoy variety of innovative solutions such as a hands free headset for voice call, printing and fax capabilities and synchronizing laptop and mobile phone applications.

This technology represents a wireless solution that is ubiquitous across a broad range of devices. It also unplugs the digital peripherals and makes a cable a thing of the past. These peripherals just need to be Bluetooth equipped. The features of this technology include:

- 2.4 Ghz frequency band is separated into hops allowing the ability to hop from one channel to another and add a stronger layer of security.
- It can network up to eight devices in a piconet,
- Devices do not need to be pointed to each other because the signals are omni-directional eliminating the need for line of sight at a range.
- Both synchronous and asynchronous applications are supported making it easy to use a variety of devices for many uses e.g. voice and internet.[8]

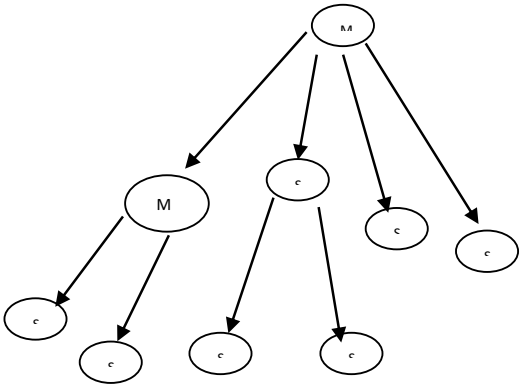
How Bluetooth Works: Bluetooth devices exist in small network configurations with the ability to operate as either master or slave. The specification allows the mechanism to switch their roles. The configuration can be single point, which has one master or one slave. Multi point configurations called piconet can have eight slaves clustered around a single master. A scatter net; a group of piconets hubbed via a single Bluetooth device acting as a master in one piconet and a slave in another piconet. The scatternet permits either larger coverage areas or a greaterr number of devices than a single piconet. The role of the master is to control the available bandwidth between slaves. Itt calculates and allocates how often to communicate with each slave and locks them out into the appropriate frequency hopping sequence. The master transmits control by dividing the network into a series of time slots among the members

A Bluetooth device does not have to be aware of the devices they are attaching to. There is a built in mechanism to inquire for devices, connect to them and once connected discover the services they possess in their database. The devices needing to connect proceed as follows:

- The master sends out an inquiry to discover a device available to connect to.
- Slaves make themselves discoverable by entering inquiry scan mode and listen for inquiry from a master.
- The slave responds to the master with a frequency Hop Synchronization Packet (FHS). The FHS contains information that is needed to

create a connection to the device including Bluetooth address and class of device.

- The master collects the FHS information and goes into page mode paging the device using the given address.
- The slave device will need to be in page scan mode to connect to a master. (Jones and Niel:6)



Master / Slave relationship

Application of the technology in a classroom setting

Classrooms fitted with technological devices are very crucial in the delivery of instructions. Interest in the extent to which texts and graphics can and do cross sites is by now quite well established. In school, a raft of concerns have focused on the extent to which out of school cultures are tried across to classroom learning in pursuit of expansive educational purposes. This has brought together the pedagogical aim of helping student become effective and powerful participants with the latest classroom appropriateness from the digital environment like the use of the Bluetooth technology. Maenpaa (2001) argues that teenagers use technology to share their lives to demonstrate that they are living in the same rhythm or wave with one's closest friends and peers. I have a sense of learners operating in constructed environments can benefit from these interactions

[4] Describe the ways in which teenagers keep in almost constant mobile phone contact with the close peer group and interact both within and beyond their immediate peer group. We see that teens share data and information amongst themselves and allow others to join them through participation. [5] Describes a process of enculturation where learners are formally instructed and learn through being part of a group. Where this is a focus, we can apply the Bluetooth technology in our classrooms. The Bluetooth technology is an exciting new way to communicate not only between handhelds and computers but with almost every device imaginable as long as its Bluetooth enabled. In a classroom, a teacher can use any Bluetooth enabled device. Bluetooth will redefine the way we experience connectivity and communicate. It will form a cordless telephony in the classroom. [6] argue that the communication landscape has changed and we need to positively change with the changes. Texts and graphics are constantly moving and changing amongst young students. One Bluetooth device can browse a file system, create or delete files or folders or transfer files to and from shared resources, ideas and discovery to enhance learning. This inculcates in learners a sense of responsibility for their devices and sharing. It is a learner centered method of learning as the teacher only plays a supervisory role. These devices simultaneously handle both data and wire transmissions enabling users to enjoy variety of innovative solutions e.g. printing capabilities.

The applications of Bluetooth technology in classroom are quite varied depending on the availability of digital devices. Images can be transferred from a still or video camera to another device such as a computer for storage, editing and printing. No specific printer drivers are required for the printer to print from a Bluetooth enabled device. Instead, the printer has the capability to decipher the information sent to it so that it can produce the desired format. In case of excursions or any form of tour, students can take varied pictures and easily share with their peers and at any time. These enhance deeper understanding of the content learnt as they freely and easily relate what they are seeing to the subject matter. A Bluetooth device that has voice capability can act as a cordless phone when in the area of Bluetooth access point or other device that has a connection to voice network. This can help to explain a point regardless of the number of students. As long as a student is within a scatter net where he / she can still understand the teachers' instructions and respond accordingly. A sample of an ear device which is Bluetooth enabled is shown below.

A headset can receive or send audio to a mobile phone or to a handheld device. This promotes discussion amongst the students themselves or the teacher. Classroom arrangement or over crowding in the class does not inhibit interaction since the devices makes it simpler and easier. One Bluetooth device can browse a file system, create or delete files or folders or transfer files or folders or transfer files to and from another Bluetooth device. Other devices like tablet PC can be used to improve the handwriting of students. It collects data about the words a student uses and he / she writes them hence the student learns the writing style and vocabulary. The Tablet PC recognizes the handwriting of every student and converts it into typed text. This helps the teacher to receive every student's personal work neatly.

Challenges facing the adoption of Bluetooth technology

Though the Bluetooth technology has several advantages and will be of great benefit if fully adopted in Kenyan schools, several challenges face its adoption and use in our schools.

Lack of Electricity: Most of these electronic devices use electric power and most of our schools do not have power

supply. In addition to that, teachers need to be trained on how to use these devices. Most teachers are not computer literate and the government needs to spend some money in the training of teachers.

Security: Security of the device is enhanced in various ways. To prevent others from seeing your device, you can set it to a non discoverable mode or you can only pair with a known device. The device has a pin for authentication and for this you can change the default pin to the pin only known to you. Generic access allows the discovery, link establishment and security levels between two devices regardless of the devices' manufacturer. Security should also be looked at in terms of theft. Such devices are expensive and hence prone to theft. Great care therefore ought to be taken to safeguard them.

Application: In a large class, learners can easily interact with the teacher through PC tablet and an ear device which is Bluetooth enabled can enhance communication especially to those with difficulty of hearing and the physically challenged (learners with special needs). With improved technology like the use of nanostation2, this can cover a wide area with a larger number of interacts.

Recommendations: The wireless world continues to grow as engineers develop faster, more robust technologies to free us from wires for greater simplicity, convenience and efficiency. From short range to long range, the wireless landscape has taken shape in our educational system in different ways. E- Learning has been enhanced across different countries and Kenya is not exceptional. We should embrace technology and integrate it to classroom instructions where applicable. Good classroom teaching is a vital part of the repertoire and we must explore its potential.

Conclusion: The wireless world continues to grow as engineers develop faster, more robust technologies to free us from wires for greater simplicity, convenience and efficiency. From short range to long range, the wireless landscape has taken shape in our educational system in different ways. E- Learning has been enhanced across different countries and Kenya is not exceptional. We should embrace technology and integrate it to classroom instructions where applicable. Good classroom teaching is a vital part of the repertoire and we must explore its potential. Technology presents images or information to the learner whereby he or she constructs new knowledge. Learning is viewed as active, constructive process where new information is extracted from the environment and integrated with prior knowledge. Uses of technological devices can enhance deeper understanding of concepts like pumping of blood by the heart. Classroom environment should be multi dimensional – so many different events and so many different related tasks to learning should be co-related for effective dissemination of knowledge. The students are different from each other, the pace at which they can work, the depth to which they can understand, the background knowledge and experience that they bring, their attitude and willingness to learn all vary. Different learners need different approaches for effective learning process. This makes the classroom attractive in appearance and functional.

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Developing Android Applications: Case Study of Course Design

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INTRODUCTION

The following is a case study over designing a new course on developing applications for mobile devices (smart phones and tablets) running the Android operating system. The course is Information Systems 3323 "Developing Android Applications for Mobile Devices" and was taught for the first time at Northeastern State University during spring of 2012. This paper focuses on how the course was developed (including: analyzing student interest, analyzing the job market, determining instructional materials, installing the software, determining the structure of the class, etc.), problems that were encountered, and conclusions that were reached.

Analysis of student interest:

Are students interested in taking a course on this topic?

Yes, during early fall 2011 two surveys were conducted in general business courses. In both surveys approximately 25% of students questioned expressed an interested in taking a course on this topic. The results of these surveys were reflected during the enrollment period. Sure enough, enrollment in the class reached capacity well before classes started in spring 2012. There was even a waiting list for students to enroll in this course.

How should the class be taught?

Of those students interested, a majority of the students preferred the class be taught using either a blended or online format. For the two reasons listed below, it was decided to offer the class in a blended format. Unlike a completely online course, the blended format:

- Allowed for student presentations. Many job advertisements in this area mentioned communication skills and keeping up-to-date on the latest Android developments as important skills. As discussed later, this presentation assignment would help the students meet both of these requirements.
- Allowed the students to begin using and understand the software immediately. By pre-installing the software in the classroom computer lab, students were able to complete their first "simple" Android application during the first class meeting. Installing the software is somewhat time-consuming and challenging. If this course were offered online, students could have easily spent 1-2 hours downloading and installing the software. During this process, some students might have gotten confused or frustrated

and dropped the course before they even started the first assignment.

Analysis of the job market:

What skills are employers looking for in Android application developers?

After examining various online advertisements for "Android Developers" the following items emerged as important skills: learning the Android SDK, Java, XML, and communication skills. Below was a typical advertisement.

Responsibilities:

Design and implement mobile applications for the Android OS based platforms. Lead the design and development of a number of Android applications for tablet and smart phone platforms. Translate specs into technical requirements used to design the product. Keep up-to-date on the latest Android SDK developments. Respond to customer feedback and testing.

Requirements:

- Experience using and manipulating the Android SDK.
- Proficient with SDK, Eclipse, Java and XML.
- Demonstrable portfolio of Android and Android-related apps is a must.
- Your presence in the Android marketplace is a plus.
- BS in Computer Science, Information Systems, Computer Engineering, or equivalent experience.
- Ability to communicate and collaborate effectively with product management and team members.

As listed in the example above (and many other job advertisements), the word "portfolio" kept reappearing. Many employers are looking for employees with a strong portfolio that showcases their work. It is highly recommended that a portfolio requirement be added to any similar course.

Instructional materials

Should a textbook be required?

Since there are numerous websites containing free instructional material on Android development, it was decided not to require a textbook. For students wanting a hard-copy reference source, the textbook "Sams Teach Yourself Android Application Development" was listed on the syllabus as "optional." Most students simply opted to complete the class using materials from the instructor and online resources. One website found very useful is (http://developer.android.com).

Should owning a mobile device that uses the Android OS be a requirement?

For the following two reasons, the instructor felt it should not be a requirement for students to own their own Android mobile device. First, the instructor felt this would possibly place some students in a financially difficult situation. Secondly, the Android editor comes with an emulator that allows the developer to view the work as it would appear on an Android device. The emulator can be configured to match any Android target (API level) and any resolution. However, at least in the instructor's opinion, a sense of complete understanding is not gained until the application has been downloaded, installed, and executed on a

mobile device. Fortunately during the spring 2012 semester, 19 of the 26 students enrolled in the course owned either an Android based smart phone or tablet. Three of the students, not owning an Android based mobile device indicated they were seriously considering purchasing an Android smart phone, when their current phone contract expired. For students without access to an Android mobile device, the instructor would occasionally install the student's app on the instructor's smart phone so the students could view their final product on a "real" device.

Installing the software:

Is installing the software easy?

Installing the software in a computer lab was a difficult task for two reasons. First the following software applications must be installed.

- Java SE Development Kit
- Android SDK
- Eclipse

Next, at least one SDK Platform API had to be installed. We chose to install SDK Platform Android 2.1 API 7. At the time of this publication, an application created using this platform could be executed on approximately 97% of all Android mobile devices. It should be mentioned, that the software necessary to create applications for the Android OS is free. When installing this software in a restricted computer lab, it is important to make sure the software is installed so that students can read/write to any relevant files.

The second big challenge was making sure students could view their work and take screen shots of their smart phones. In some cases, additional software had to be installed (e.g., device drivers) to allow students to perform screen shots of their particular phone. Fortunately, installing the software "Samsung Kies" [HREF 1], allowed most students the capability to take screen shots. For the students to view the apps they created on their own mobile device, it was also necessary for students to change their settings to allow installation of non-Market applications (see Figure 1) and allow USB debugging (see Figure 2).

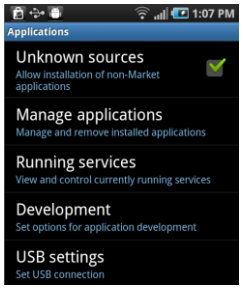

Figure 1: Allowing installation of non-Market apps

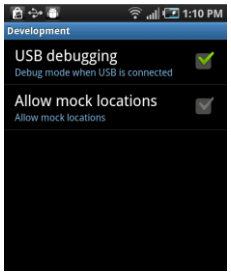

Figure 2: Allowing USB debugging.

Prerequisites:

Should there be prerequisites for this course?

It was decided that no prerequisites courses were required to enroll in this class. This decision allowed any student interested in this topic to enroll in this course. It should be mentioned that any programming course (in particular the programming language Java), any understanding of XML, or any knowledge of HTML would be beneficial.

Structure of the class:

How was the class structured?

The class was taught in an "optionally" blended format on a Tuesday/Thursday

schedule. The instructor was present on both days. However, for the students, attendance was required on Tuesdays and optional on Thursdays. On Tuesdays new content was introduced, new assignments were made, homework was collected, and graded work was returned. The class was taught in a computer lab using a very hands-on approach to learning. Typically, assignments consisted of two somewhat similar exercises as shown in Figures 3 and 4.

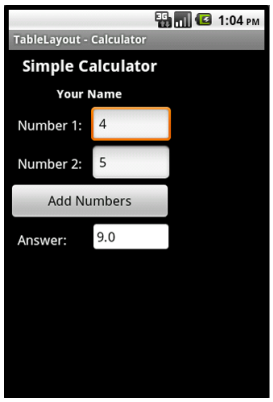

Figure 3: Simple Calculator

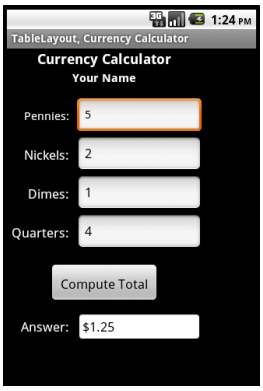

Figure 4: Currency Calculator

For example, during the Tuesday class, the instructor walked the students through completing the application shown in Figure 3. This included: providing an overview of relative layouts, walking the students through the XML code to create the layout, and writing the JAVA source code to implement the app. The students then had one week to create the application shown in Figure 4. During Thursday classes, which were optional, the instructor would answer any questions, especially those dealing with completing the exercise shown in Figure 4. Typically, about 50% of the students would need help and would attend Thursday's class as well. The remaining students, would either figure out the assignment themselves, or consult the web, or the class discussion board for help.

Throughout the semester, 15 homework exercises similar to the one above were assigned.
Additionally, an exercise was assigned the first day of class that made sure students knew the basics and advanced features of Android mobile devices. Some of the items on this first task are shown in the table below. The complete Exercise #1 assignment can be viewed at [HREF 3].

1. Add an application icon to your **Home Screen**
2. Remove an application icon from your **Home Screen**
3. Create a new folder
4. Add a bookmark to your **Home Screen**
5. Change the input method (Swype, Android keyboard)
6. Display the battery level
7. Display Android (Firmware) version
8. Allow installation of non-Market applications
9. Allow USB debugging
10. Read a bar code or QR (Quick Response) code using an app like **Red Laser**
11. Display the Longitude and Latitude of your current location using an app like "GPS Status"
12. Open the "Task Manager"
    - View all active applications
    - End all active applications

A final project and a final exam were also assigned. The final project involved the

students creating a more advanced app with at least the following:

- Splash screen
- Main menu
- Settings
- Help screen

Portfolio: During this class the students were highly encouraged to create a portfolio of their work that showcased the Android apps that they created during this class.

Student Presentations:

Should student presentations be a requirement?

Many job advertisements listed excellent communication skills and being up-to-date on the Android developments as requirements. To help improve the communication skills of the students and to help familiarize the students with some of the thousands and thousands of apps available for Android devices, students were required to create a 3-5 minute multimedia presentation over an Android app that they had downloaded. All presentations had to be over different apps. Presentations had to include a minimum of 5 screen captures. This requirement forced the students to learn how to take a screen capture of their mobile device. It also encouraged the students to present on more advanced apps, since basic apps like "Magnifying Glass" and "Flash Light" only used a single screen. The presentation was worth 50 points. Like most presentations, points were awarded for delivery and content. However, points were also assigned for marketability (i.e., trying to convince the audience to download the Android app). Shown below is a condensed breakdown of points. The complete "Presentation Evaluation Form" can be viewed at [HREF 4].

Delivery:

- The presenter maintained strong eye contact and used effective gestures
- The presenter seemed enthusiastic about the topic
- The presenter was dressed appropriately
- The presenter seemed knowledgeable of the subject

Content:

- Introduction - gained attention and interest / introduced smart phone app
- Body - presented main features of the app / organized / performed background research
- Conclusion - reinforced features and name of the smart phone app

Marketability:

The presentation encouraged the audience to download the Android app that was presented. A role play situation may be established; where the speaker asks the audience to assume they are members of a particular group. For example, the speaker may ask the audience to pretend they are active joggers before presenting on the app "RunKeeper" or "Buddy Runner".

CONCLUSION

In this paper a case study was performed over designing a new course on developing applications for Android based mobile

devices. In particular the following questions were addressed:

- Are students interested in taking a course on this topic?
- How should the class be taught?
- What skills are employers looking for in Android application developers?
- Should a textbook be required?
- Should owning a mobile device that uses the Android OS be a requirement?
- Is installing the software easy?
- How was the class structured?
- Should student presentations be a requirement?

Hopefully, the answers to these questions provide some insight into some of the problems and trade-offs encountered in designing a new course over developing Android applications.

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Learning to Baseline Business Technology

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ABSTRACT
Learning to Baseline Business Technology

Businesses often pay monthly technology bills, sign multi-year contracts, and make purchasing decisions without having an overall technology plan. That plan includes a technology baseline to fully assess existing technology.

A CIO's goal is to align IT with business goals. Businesses must know total cost of ownership and the return on investment for all technology purchases and monthly costs. A business must also be able to manage technology assets and best utilize resources across the business.

Teaching students to baseline technology will enable them to track and manage costs, discover errors and waste, and consolidate and improve existing technology.

Keywords
Addressing: Acquiring metrics and developing budgets; business cases for learning measurement; Return on Investment (ROI) and Improved Productivity

Anyone who has ever looked at a map and been confused can appreciate very quickly the old adage 'you can't get where you're going if you don't know where you're at'. This is equally true for businesses. In order for a business to accomplish this task they too must determine where they are. This process is know as baselining, or benchmarking. According to Cheryl Yaeger of BenchMark Consulting International:

> *Webster defines benchmarking as "the study of a competitor's product or business practices in order to improve the performance of one's own company".*
> *While Webster's definition of benchmarking focuses on external competitors, many organizations also find value in using internal benchmarking programs to improve their performance across geographic sites, business lines and functional support units.*[1]

Baselining serves an even greater purpose within a specific business unit, such as IT or telephony support. It provides a basis for change, and subsequently assessing the effect/value of that change. Linda Russell, in her online article, 3 Main Reasons for Baselining states: "The main benefits of having a project baseline are: Ability to assess performance, Earned value calculation, and Improved future estimating accuracy. [2]

This process is often taught in business and finance departments but rarely is associated with technology. However, technology is a determining fiscal solvency. In fact, technology often represents a significant portion of the capital for a company and must be carefully considered when changes occur. The teaching of baselining, related to technology, should happen in technology classes. It is often more complicated than keeping track of inventory, products produced and end of year balances. Technology gets outdated, neglected and very difficult to track over time.

As a part of the Communication Technology program at Eastern Michigan University the baselining of technology and analysis of need occurs in the CMT 408 Telephone Technology course. To baseline/benchmark equipment requires assessing what is still in use, what is functional and what is physically present but no longer viable within the context of the current system. With regard to telephone technology this is typically equipment that has been modified, added to or evolved without the benefit of a change management process and documentation over a period of time, often many years. The class utilizes real data gathered either from a business or industry where a student works or has access or by utilizing the university telephone system located within one of the building. The class activities outlined below describe the analysis of existing facilities, the development of a request for proposal (RFP) based upon future need and the development of a rubric for the evaluation of proposals submitted to respond to that request.

The assignment for CMT 408 Telephone Technology is designed to assess a company's Telecommunication System to determine what the company currently has and what new equipment may be needed. commodity and must be planned for and evaluated in its own measure just as it is accounted for on the ledger sheets of those Once the need has been determined, sets of proposals are assessed to obtain a recommendation for purchase. The final portion of the project creates a plan for the company to follow during installation of the new system.

To begin the preparation portion of the assessment, students must locate the point where the telephone company's network ends and the customer's wiring begins, also known as the demarcation point or the dmarc. Everything at the dmarc needs to be recorded or photographed. This includes all labeled lines and circuits whether they are connected or not. At this point, it should be determined if any additional equipment will be needed to support the new system. The purpose of each line and circuit must be determined. This can be done by comparing the numbers recorded at the site with current phone records and/or by calling each number. Students will analyze the current phone bill to determine what contracts are in place and when they expire.

Specific items that should be included in the inventory are:

- Telecommunications entrance and demarcation/termination
- MDF/switch room, IDF rooms
- Structured cable systems
- Risers, feeders, conduit/pathways, station cable
- Wireless: LANS, access points, stations

The equipment/feature inventory should include:

- Active – In-use
- Inactive – Available, warehoused

- Inactive – Out-of-service, in maintenance, telephone equipment repair
- On order
- Warranty/out of warranty
- Plan for purchase of new equipment (reorder, new technology, etc.)
- Equipment, service, feature
- Circuits
- Vendors
- Purchase orders
- Technicians/other personnel

Additionally, a floor plan of the company is needed and must be marked to indicate all of the locations for telephones, additional data cables, fax machines, computers, printers, and any other equipment that requires a voice/data connection. At this point, a questionnaire to determine the internal needs of the company should be completed.

The next section of the assignment requires the students to assess several proposals to determine which system to purchase. Given the company's priorities for a new Telecommunication System, a scoring grid is set up to help analyze and rate each proposal. After the scores for each proposal have been assessed, a recommendation and justification for purchase is made.

The final portion of the project is to prepare for the installation of the new Telecommunication System. A call flow diagram is created, based on the company's needs, to indicate how the new system will handle inbound calls. A current phone list should be created and distributed to personnel of the company. After determining the usage of phones for the managers and different departments, phone templates will be created. Help procedures for employees and a plan to handle any "down time" (no phone access) when the system is cutover are the final portion of this project. All of the information obtained during this project is presented to the class by each group. If a real company was used for the project, students are also encouraged to present their findings to that company. This project serves as a real world example and practical application of baselining, cost containment and technology implementation.

One of the major drivers for change, especially in a down economy, is the need for a business to accomplish more with fewer resources. Businesses are constantly looking for ways to lower their operating costs and reduce budgets. One area that is often overlooked, but typically ripe with opportunities for savings is technology and telecommunications.

A company's chief information officer's primary concerns are: aligning information technology with the business's goals, reducing costs, and proving return on investment for any new technology purchases and upgrades. In the scope of the course, students are taught the process of cost containment. They are also introduced to the concept that telecommunications is something that enhances the profitability of a business, not merely an expense that must be paid monthly.

Part of the process of cost containment is to know exactly what technology assets a company has. This means that an inventory/audit should be taken of all equipment, lines (and what they are used for), circuits (and what they are connected to), cabling, etc. Included in the inventory should be items such as contact phone numbers for troubleshooting and outages, warranties, service contracts, service level agreements, and any other contracts that are associated with the telecommunications.

There are often many errors in billing. According to Richard A. Kuehn's article, up to 50% of all telecommunications bills contain errors[3]. When looking at bills one should: ensure that what is being billed is actually in use, review local and long distance usage, compare charges to contract terms, ensure any service level agreements were met, and review all cellular/wireless bills.

All bills should be reviewed on a monthly basis. Part of the technology costs are fixed and should not vary from month to month. Contracts and fee-based services should be audited to ensure that the amount that is billed is the actual amount being used. All variable costs should be carefully reviewed. On a telecommunications bill, these variable costs are often included in the sections "Other Charges and Credits", where miscellaneous billing occurs, and "Moves, Adds, and Changes", where any changes to the account and fee increases are found. These two areas are particularly prone to containing errors.

Benchmarking should be completed to get a clear picture of a business's information technology assets. By creating a snapshot of all services and equipment, a business is able to establish accurate, controlled inventory of assets, services, and users; track and manage the cost of telephony assets; negotiate refunds on overcharges/errors; disconnect unused services (lines/circuits) and remove from billing; and consolidate accounts and invoices.

It is important to keep up-to-date documentation, which can include:

- Contracts
- Escalation & emergency contact lists
- Business continuity/disaster recovery plan
- Network diagrams/schematics
- Circuits, equipment & feature inventories
- Directories (multiple copies)
- Back-up storage (both on and off-site)
- Service delivery/order process workflow
- Repair – break/fix process workflow – for a business to contain costs, orders and repair requests for new service should be centralized

New projects and technology upgrades can be funded with the savings found through refunds and cost reductions.

Ultimately, the desired outcomes of this work includes lower costs and total cost of ownership, improved return on investment, and potentially continued employment as businesses often look to cut staff in times of financial stress.

As a business is making a plan for their IT strategies, they may think about a number of things and ask important questions such as:

- Is the company growing, maintaining, or downsizing?
- Does the company make fast decisions?
- Does the company have a cost reduction strategy?
- Is IT/Telecom in step with the organization's goals?
- How can I:
    - Reduce costs, risks?
    - Increase revenue & profits?
    - Improve customer satisfaction & retention?
    - Enhance telecom's contribution to the bottom line?

In conclusion, the importance of technology baselining may very well be a factor in the survival, or demise, of a company. John

Hagel and John Seely Brown expressed it in this way:

> *'The shift to Web services architecture for corporate computing is not only a matter of adopting new technology. It will require broad organizational and managerial changes as well as the development of new kinds of capabilities. A particularly big impact will be felt in the corporate IT department. CIOs will face new challenges and assume new roles'.*[4]

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for their online newsletter. She anticipates receiving her Bachelor of Science in Communication Technology from Eastern Michigan University on April 16, 2011.

Google Plus in the Higher Education Space. Are Educators ready for Social Media Learning in Schools?

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ABSTRACT

Social Media have an increasing influence on higher education. In the past mainly privacy issues discouraged educators from using social media in teaching, but with Google Plus a new way of communicating is promised. Apart from the possibility to post information for students, use a videoconferencing tool, or a tool to get updated on selected topics, instructors can also use Google Plus as a tool for cross-course communication. In general, nearly all web services can be adapted for educational use. It requires some experimentation from research and educators in order to find out ways to use Google Plus to improve education, and cross-course communication is only one part of it.

Keywords: education, Google Plus, social media.

1. INTRODUCTION

Nearly all web services can be adapted for educational use. For education, social media offer new possibilities to structure and perform learning processes. Although some instructors do use social media for their courses, privacy concerns always throttle instructors' affinity for social media. Google Plus seems to offer a possibility to overcome this privacy issue, in using a methodology to group one's contacts. It has the potential to improve students' collaboration through circles, conduct research for projects with sparks, improve the instructor-student and student-student relationship and support blended learning with the hang out functionality. In this contribution we show how to design a course using Google Plus functionalities.

Google Plus promises more structured control over sharing, with circles as one dominant feature. As this hype grows, increasingly more people will receive invitations to that social network and a discussion started on how to use Google Plus for education. Instructors could teach new material, review information from class, share it, or answer questions all in a virtual class meeting. Google Plus could offer an opportunity for distance learning or at least adding facets to the traditional in-class-studying by using course content systems for more or less offline learning. It needs some play from educators and research to find out ways to use Google Plus to improve education and to become aware of some kind of restrictions or limitations.

2. SOCIAL MEDIA AND EDUCATION

Young people are familiar with social media, using them for private communication and following friends, other individuals, groups or institutions. Using social media in education means using a system young people know how to use und use frequently to get in touch with students and to motivate them contribution to courses they attend. Social media have been integrated into the daily practices of many users, supported by different websites, tools, and networks. Everyone can add or edit information on social media, supported by digital tools enabling you to create, change, and publish dynamic content [1,2]. Social media focus on the use of accessible and scalable communication techniques and social interaction and have begun influencing organizations in their knowledge sharing procedures. Implementing social media in higher education is an innovative process located at many levels of universities [3]. E-learning developers, university management and course instructors have to be aware of dynamic technology development, the available tools for social interaction and changing user preferences [1,3,4,5]. 'Social network sites are 'web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system' [4].

3. GOOGLE PLUS

Google Plus is a social media tool, the main features of it are circles, hangouts, sparks, and huddle. Circles are contacts you can group, using different criteria for grouping, such as interests or types of contact; where contacts can be added to circles by drag and drop. A benefit offered by Google Plus is that one has the possibility to define with whom posted content should be shared by selecting circles for selection or adding individual users. Instructor can create circles for every course they teach, being able to post information for one or more courses (circles), which is not visible for other contacts. Using this private posts are not shared with students although an educator uses Google Plus to communicate with students and for business or private relations as well. User groups can be selected to manage the

access to single posts [6,7,8,9,10]. With sparks user get the possibility for an keyword based research, offering a customized way of searching and sharing. User can store their sparks and update their keywords. Results of such sparks can be shared with circles or selected individuals. For educators, this feature can be used for a course to share important search results easily with the whole course (circle) [9,10,11]. Hangouts can be generated and used as an instant videoconferencing tool with circles, or selected contacts in circles. Small groups can interact on video. This feature could be used in education for the online office hours of instructors, explaining assignments, talking about projects, group work or communicating with students completing a project in a company for one semester, facing problems, or needing some kind of support [3,6,7,9,10]. Huddle offers group chat possibilities. For education, integrating this feature could offer benefits for both students and instructors. Huddle is part of the 'mobile' feature, offering services using a mobile phone, including other services as well, such as instant upload (for pictures and videos from a mobile phone to a private folder in Google Plus) and location (a service to add one's current location to every post) [11,12].

4. CHALLENGES FOR COURSE DESIGN

While use of social networking services in education have been hindered by concerns about how teachers can connect with students without having to worry about privacy issues, Google Plus keeps privacy intact. Once teachers know this, they can take the next step to integrating some of Google Plus' features into their classrooms. One of Google Plus' features is the circle. Circles allow users to organize contacts into groups. They can then choose to share updates only with certain circles. This effectively prevents the privacy issues many educators fear when it comes to social media use in education. A teacher can share information with a group of students without risking letting them access personal information. It could be used to create a class group online, like a learning management system, or to identify clusters based on other needs. Circles could be used in support of ubiquitous learning. Google Plus' sparks allow users to mark articles, blogs, and other information relevant to topics of interest, and label each group of websites according to their topics. In case you share each group of topics with people in different circles, Google Plus becomes a project and an useful research-sharing tool to classrooms. Many sections of a Google Plus profile can be secured quickly and precisely [2,3,6,7].

Google Plus offers sparks (a customized way of searching and sharing), circles (a chance to direct your communication to your personalized groups) and easily embedded media within status updates. It offers hangouts, where small groups can interact on video [13].

The user interface of Google Plus is clean and easy to understand, circles are an easy way for users handling their contacts. A challenge is to convince users to use circles for organizing their contacts because a lot of users do not want to organize friends and other contacts, although the user interface is well designed. Google Plus is designed to minimize noise in the stream through the use of circles, but it is still too noisy for most users. The big issue is that posts are pushed to the top whenever there's a new comment, something that most users think is unnecessary. There are also still issues with collapsing posts with long comment threads. Google Plus can not be used with Google Apps accounts. With Google Plus hangouts up to 10 user can video chat simultaneously with each other. Instead of creating a group video chat system where you reach to your friends to chat, users instead create "hangouts" that pop up on their feeds. Users can then join those hangouts.

There are three forces at play when it comes to education and social media. 'The first one is a lack of force, which makes many educators unwilling and uninterested in integrating the technology into their classrooms. The second is the force of fear, which means the pressure on the part of administrators, district officials, and politicians to curtail and ban teacher and students' interactions online. And finally, the third force is that of more and more educators who are embracing social media and advocating its use on- and off-campus - for student learning and for teacher professional development alike' [11].

'Google Plus is easy to navigate from within the system and easy to access from outside (adding the plus one button, seeing the red update box next to my name, the share box, etc.) The result is a system that has a ton of integrated features while still feeling simple' [13]. Using Google Plus 'Schools could learn from this by designing curriculum that allows for fluid integration while still creating a sense of natural boundaries between subjects. Both in physical and in intellectual space, schools wouldn't have to be free of walls, but rather open to half walls, open doors and open windows. Schools wouldn't have to be entirely project-based or independent work, but they could be open to a balanced, nuanced approach of integration and specialization' [13].

5. DISCUSSION

Although some instructors do use social media, such as Facebook or Twitter, for their courses, they are not ideal for university settings. Privacy concerns always throttle the 'need' of instructors for social media. Too many public elements show too much private information about instructors to all their friends or followers, without any possibility to filter or group them and decide who is allowed to see which message. Some kind of privilege classes would be great, such as distinguishing between limited access, full access, and access on demand for individual friends or followers. Google Plus could offer 'possibilities for students to share links and build a classroom community. Teachers could post homework information, project links, and hold class discussions, all while keeping the circle strictly education related' [8]. Social feeds can be tailored to different types of contacts (grouped in circles). Whenever something is posted, you can choose who gets to read it [8]. By using Google Plus, instructors can open their social networks to their students: they have to create a circle, add their students, and share school-related information. The flexibility that Google Plus offers is that one can decide to follow someone who has the possibility to limit the updates to specific circles. Google Plus could become a 'one stop tool for personal and professional social networking needs' [8].

'School could function as a flexible community while still allowing students to engage with the outside world (plus one approach). Students could engage in community with concentric circles while personalizing their learning according to their own interests (sparks). Students could meet based upon shared social status (age-based, ability levels) while also letting them share in interest-based formats (multi-age classes based upon interests). We could recover recess (hangouts) and we

wouldn't have to depend upon third-party apps invading our curriculum and forcing us to interrupt real learning with incessant testing updates. We could learn from Google in some of the smaller features, too. Maybe wait a little longer in student response time and in discipline. Schools need to shift from differentiation to customization/personalization. They need to allow students to define relevance and meaning, to sift through multiple media choices, to organize information according to the meaning they create rather than the teacher-driven transmission of conceptual systems. Schools could also learn to create fewer options and provide more freedom, relying on the power of freedom and simplicity to generate creativity and authenticity [13].

6. CONCLUSION

The basic functions of Google Plus could support instructors in keeping students updated or getting in touch with them. Assuming that, in the nearer future, after being available, Google Plus will be used by an increasing community and become a common tool, such as other social networks (Facebook or Twitter), this system could support instructors, and some tasks that are currently fulfilled by other systems, such as course contents systems or social networks, could be shifted to Google Plus.

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Towards Open Government Data: the publication of the Brazilian Social Security System´s Statistical Data

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ABSTRACT

The Governmental Open Data theme is being explored and begins to be treated as a priority by the Brazilian Government from a strong trend established by society itself, requesting more transparent governmental processes with access to public data in a fast and easy manner. To this end, efforts have been conducted in developing of technological solutions involving fundamentally the availability of governmental databases and the interoperability between them. In this direction, we sought to build a framework to facilitate this integration and to support the construction of instruments to disseminate the knowledge and the semantics of all information and data accessed by society in general. In this report we explore the use of analytic philosophy to the construction of domains, ontologies and controlled vocabulary, as well as the journey being travelled by Dataprev towards providing the Brazilian Social Security System with methodological and technological instruments in order to enable the participation of the society in the implementation of Electronic Government.

Keywords: Governmental Open Data, Analytic Philosophy, Work Related Accident, Brazilian Social Security System, Brazil

1. INTRODUCTION

Within the scope of this research, some political milestones have been determinant to the technological definitions conducted in this effort.

The first milestone is the publication of Decree nº 6.932 of August 11th, 2009, signed by the Brazilian President [1] which "disposes about the simplification of the public services to the citizen, ratifies the exemption of notarization of documents produced in Brazil, institutes the 'Letter of Services to the Citizen' and makes other provisions". For this purpose, this Decree brings in its 1st. article, lines II and VI, that the Executive Power, in its relations with the citizens, must share information and apply technological solutions, which will not only simplify the processes and procedures, but also provide better conditions to make the information available to the citizen.

Besides, the Decree foresees in its 4th article the availability of official data bases managed by the Executive Power for public agencies and entities interested in the access to the information contained there.

The second was the publication by US President Barack Obama of the document "Memorandum on Transparency and Open Government" [2], which defines the guidelines of the US Government for his administration with regards to the access to American Government data, ranging from the question of the internal management of information up to the publication of Government data to the public in general. The fact is that after the publication of this document, the results were US initiatives around the so-called Open Government, which strengthened actions related to the theme, implying the availability of official data bases to the community in general. This milestone also fostered other related discussions, mainly about technological patterns concerning the theme such as RDF, OWL and SKOS, as well as definitions about the license standard to be attributed to the published data.

The third and more recent political milestone noted is the one related to Law 12.527 of November 18th, 2011, or simply Law for Information Access [3], which objective is to guarantee to the citizen the exercise of his right of access to information produced and maintained by all governmental entities. However, it poses a great challenge to the State in its 5th article, for it states that "the access to information, which will be opened up" shall occur "through objective and agile procedures, in a transparent and clear manner, and in a language easy to understand".

It was within this context that emerged the project to use the proposal formulated by Tim Bernes-Lee, using the Linked Open Data (LOD) [4] in the publication of data of the Brazilian Social Security System Statistical Yearbook. This project allowed not only the access to data contained in the Yearbook, but also the use of these data for exchange operations with other bases, bringing us a common information space and allowing the

exploration of interconnections still not considered in the information of the Yearbook.

This paper presents a short contextualization of the project to subsequently formulate the conceptual background being used for publish data according open data assumptions.

2. CONCEPTUAL ISSUES

2.1 Open data highlights

It should be noted that the Web has dramatically changed the way knowledge is shared, because one of the greatest factors of this environment success is the freedom of its users to create and spread information anytime and anywhere. Links between documents through hypertext structures, allow users to browse through the informational space where the documents are published by means of the so-called Web navigators, while search engines associated with analyzers of document links, allow users to localize the requested documents. This combination was the main responsible for the success of Internet and for its constant full increment [4].

Thus, according to David Eaves, a researcher who investigates the theme, the way to promote the use of Open Data, must obey the three laws [5]:

- If the data can't be found and indexed on the Web, it doesn't exist;
- If the data is not open and available in a format understandable by a machine, it can't be reused;
- If any legal dispositive doesn't allow its reuse, the data is not useful.

In additional to these laws, the assumptions suggested by the International Aid Transparency Initiative (Iati) according publication of Open Data of Brazilian´s Planning Ministry [6], are materialized in eight principles[7]:

- Data must be complete: All public data are made available. Informations like public data are not subject to limitations of privacy, security or access control;
- Data need to be primary: Data are published as collected at the source, with the highest possible level of granularity not in aggregate or modified forms;
- Data must be timely: The data is made available as quickly as necessary to preserve of its value;
- Data must be accessible: Data are available for the widest possible range of users and the widest possible set of purposes;
- Data must be machine readable: Data are reasonably structured to allow automated processing of it;
- Data must non-discriminatory: Data are available for all without requiring application or registration;
- Data must be available in nonproprietary format: Data are available in a format over which no entity has exclusive control;
- Data must be licensing-free: Data are not subject to any restriction of copyright, patent, intellectual property or trade secrets. Reasonable restrictions relating to privacy, security and access privileges are allowed.

2.2 Brazilian Government normative milestones

There are actions within the Brazilian Government to improve the quality of the information and create tools to facilitate data exchange. The initiatives in course can be observed in reports present in the publication Open Data to Democracy at the Digital Era which may be considered as the genesis of the problematic to the treatment of the information in the Government database:

> The huge amount of codes of the Corporate Structuring Systems of Government, added up to the complexity of the businesses they support and to the many different computing platforms that sustain them, bring us to the various attempts to the evolution and integration of these systems. Through the years, this natural difficulty to implement improvements pointed out in the complex environments, has encouraged the creation of a Data Belt, DB, to give support to the decision-making process of the Government. […] The data of SGAs [Administrative Management Systems], often extracted into spreadsheets, are augmented with other declarative information, other documents, news, etc, constituting an important basis for the decision making at the strategic level of the Government [8, pp. 25].

It is also in this context that the DadosGov Project [9] is being developed. This Project aims to create an Open Information Catalog in order to improve public management and facilitate monitoring by the society. Developed by the Information Organization Committee of the Brazilian Presidency (COI-PR), this catalog was built from some assumptions for the availability of information [8]:

- Presentation of the information organized into thematic trees and historical series;
- Use of groups of information to facilitate the acquisition and assignment of responsibility for the quality of the data structure and its content;
- Specify and structure the requirements of the general level to more specific levels;
- Organize the storage of data in standard format for cataloguing.

The modeling work of this catalog was also developed with the support of the Global Data Model where, through the mapping of the Electronic Data Bases of the Brazilian Government systems, it was sought to integrate the structure, the semantics and the processes involved on the actualization of the respective data repositories.

Add to this the set of efforts to organize this issue which is being developed by the Secretary of Logistics on Information Technology (SLTI) of the Ministry of Planning. In a recent debate also carried out at the IV CONSEGI, Mrs. Miriam Chaves – of the Secretary of Logistics on Information Technology of the Ministry of Planning – presented in general lines the proposal for the integration and use of the LOD infrastructure in the Government (Figure 1).

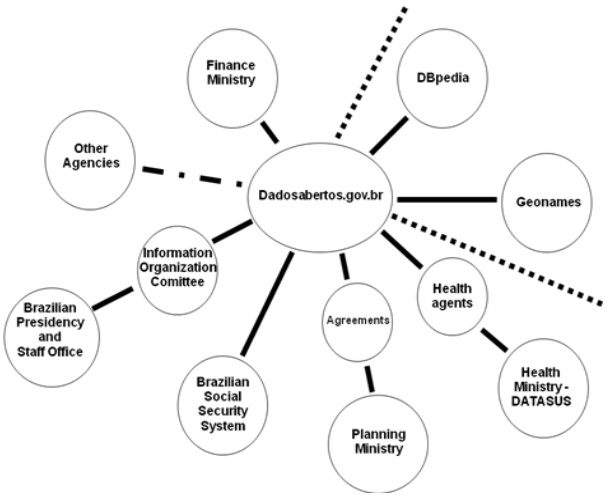

Figure 1: LOD Structure and Brazilian Government Data [10]

SLTI's efforts culminated in the partnership between the Government and the society, represented by organisms of standardization, universities and Non-governmental Organizations, to the purpose of developing the INDA (National Infrastructure of Open Data) [11]. This infrastructure follows the model practiced for the generation of INDE (National Infrastructure of Spatial Data) [12] and consists of set of patterns, technologies, procedures and control mechanisms necessary to meet the conditions of spreading and sharing public data and information in Open Data model, in accordance with the stated in the project e-Ping (Project of Interoperability in the Government) [13].

Is within this scenario full of alternatives and examples of structuring according to assumptions for open data that the project under development by Dataprev (Technology and Information Company of the Brazilian Social Security System) inserts itself.

3. THE PROCESS OF ANALYSIS AND REPRESENTATION OF THE ELEMENTS

In line with the evolution of technologic environments, Dataprev invested in the organization of a project to insert Social Security in the context of Open Data.

In this direction is initially highlighted the role of Dataprev, which manages major social records of the Brazilian Government, such as the data bases Social Security system, the National Register of Social Information (which contains the records of all the ties of social security and labor contributions of the economically active population in Brazil) and the National Register of Deaths (which concentrates the record of all deaths registered in notaries in Brazil).

The understanding of the knowledge present in the Universe of Discourse[1] passes through the perception of the structuring of this context organized in a net of nodes and links. A detailed description of these elements is associated with a theoretical specification, which includes a set of expressions formulated in a language that represents the detailing to achieve the goals of the Universe of Discourse. From the analysis of the domain elements and their associations it was sought to classify the elements, the categories and the hierarchical order of these elements. This whole process was based on the assumption that there are concepts so general and abstracts that they can encompass all the other remaining elements [15].

Additionally, it is know that in order to publish information in the Web is necessary to perform the understanding and representation of information. However, we know that understand and represent are only parts of the problem, because these characteristics, besides allowing a better spread of knowledge, help in the process of recovering of resources available on the Web. In this direction, other disciplines[2] need to be treated and, especially on the Web environment, the proposals for the organization of domains also have to cover navigation alternatives, because they can only "be obtained from a well-defined navigational space" [17]. It should be noted that is not objective of this report explore issues of navigation alternatives.

3.1 First version delivered

Therefore, to overcome this challenge, it was initially necessary to understand the domain to be published, composing the planning phase of the informational environment to be disseminated. This phase was conducted through meetings for structuring the scope, led by the Department of Information Management in partnership with the Presidency of Dataprev. These meetings had as main objective to evaluate the list of the existing demands to use the Brazilian Social Security System data as well as to understand its relevance to the community.

The result of the meetings to define the scope was the decision to publish the data available at the AEAT – Statistical Yearbook of Work Related Accidents [18], for, although these data are already published by a extraction tool that allows queries on the internet [19], this publication does not follow the principles for the use of open data, hampering the reuse of this information by society in general.

The AEAT contains data on Work Related Accidents that were administratively registered or characterized as such by INSS (Brazilian Social Security) in the process of granting benefits. This information is processed, organized and made available in aggregated series. For the first version it was possible to get to the representation in Figure 2 as the final model for publication:

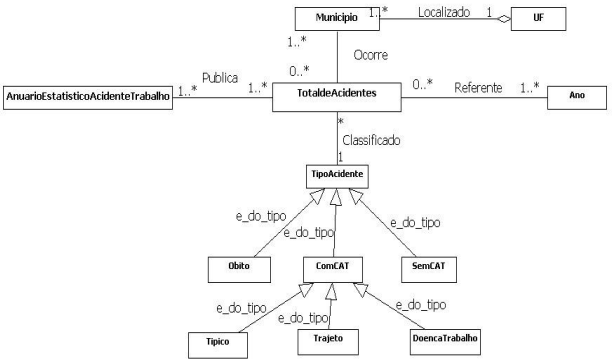

*Figure 2. Domain Model adopted with respective cardinalities.

[1] Universe of Discourse – UofD is a context where the system must be developed and operated. Are part of the UofD the sources of information and all people related to the system [14].

[2] Like Information Architecture [16].

With the developed model specification (Figure 2), we set out to the process of extraction of these data from AEAT's operational bases [20], to subsequently start the process of transformation and loading to publication. The result of this first effort of publication is available at Dataprev Webpage address http://api.dataprev.gov.br.

However, all the work developed in this first increment still lacked information to cover the semantics of data. Despite the attempt to structure resort to models and to a dictionary of terminology, these tools still required human intervention because they didn't allow the automated processing of information to bring semantics to the data.

The generated model satisfactorily answered the questions identified as relevant, but, it was inferred that the process of abstraction developed to arrive at the representation of objects types needs to be understood in the extent that variations may arise in its use. These variations arose primarily from the domain that is the target of the representation.

4. DISCUSSION

Answering the longing of the society in general, the effort for the publication of Open Data makes it clear the need to provide information to a better participation of the society in the management of our country. However, the major challenge is to make available the huge volume of information in a way that it is possible the (re)use of all this set of data, managing in a more effective way possible the conflicts of heterogeneity (for example: similar names that denoting different concepts (homonymous), different names to the same concepts (synonymous, etc) between the basis that host them. One of the biggest questions arising with this work is how to implement an agile process of publication that also permits to aggregate data semantics, and thus, leads from a Syntactic Web [21] to a Semantic Web.

In this direction we can point out two other issues that also deserve special attention in the continuity of this research.

The first direct to elements of domain. While investigating the set of elements present in a Universe of Discourse, which consists of information aggregated and summarized in some dimensions, in contrast with assumption suggested by IATI - "data need to be primary" - new visions and restrictions must be observed in obtaining the desired semantic agreement.

The second direct to the technological model to be used. This model must allow the integration of the database between them and also enable the interoperability between data so that the information required may be published. Among the technological models to be considered, the one that proved to be closer to the efforts made is the so-called hybrid ontology approach [22], where local ontologies for each database are built from a controlled shared vocabulary (shared vocabulary). Thus, the mapping between the elements is done, enabling the interoperability between the databases.

5. FINAL CONSIDERATIONS

The project briefly described before, had no information that covered the semantics part of the data in a way to allow a greater grade of integrated and collaborative operation between applications. It is possible to perceive that in accessing the data available, there was still the necessity of human intervention to understand the data and their relations in view of the way this information was published on the pages. Therefore, it was reasonable to suppose that we were facing a Syntactic Web and we needed to move towards a semantic Web, since endowing the Web with facilities to allow the automated processing of information and content is one of the natural ways for us to work with the myriad of data present on the Internet today.

Considering that the Decree nº 6.932 is already in force; that the Law nº 12.527 will be effective from May this year, 2012; and that the structuring aspects, either of technological or institutional nature, are extremely challenging; will be necessary to conduct our work based on some decisions.

First, the sequence initiated with the Brazilian Social Security System Statistical Yearbook, for all the previously outlined reasons should be kept, because it is fundamental to the process of consolidation of the knowledge to be acquired in the technologies demanded.

The second is related to the implementation stage[3], because the assemble of class hierarchy begins to enable the construction of semantics, in that it is possible to use structures XML and RDF to represent these hierarchies in a language processable by machine. On the other hand, the use of standard vocabulary such as SKOS and SCOVO is an important condition to enable the reuse of this work in other efforts tha are being planned within the Brazilian Government, as it can be observed in the project e-vog, which is preparing the Electronic Government Controlled Vocabulary [24].

Finally, the consolidation of technologic basis for the interoperability of heterogeneous databases combined with the ability to openly publish data and information demanded by society, will bring to Dataprev the capacity to provide services that enable a greater participation of the society in the implementation of the Electronic Government in our country.

6. ENDNOTES

***Notes on Figure 2 labels:**

- **Município -** County or City which is located in a State
- **UF** – a Brazilian State
- **AnuárioEstatísticoAcidenteTrabalho** - Annual publication produced by the Ministry of Social Security on Work Related Accidents
- **TotaldeAcidentes** – Sum of Work Related Accidents
- **Ano –** Year of reference where the sum of accidents was recorded
- **TipoAcidente** - Classifies the type of accident suffered by the insured.
- **Óbito -** Is the number of accidents that have resulted in the death of the insured.

[3] According to what Rautenberg, Todesco and Gauthier [23] claim, it is possible to place the project here reported in the formalization stage, leaving the implementation stage to be covered and finally reach the cycle of maintenance and evolution of this paper.

- **ComCAT** - Is the number of accidents registered with the Social Security System. It is not considered the restarting of treatment or the removal due to aggravation of injury from accidents at work or occupational disease that were previously communicated to the Social Security System.
- **SemCAT** - Is the number of accidents not registered with the Social Security System. The accident is identified by one of the possible nexus: Technical Professional/Work, Social Security Epidemiological or Technical by disease treated as accident. The identification is made by the way benefits are granted.
- **Típico –** Are the accidents resulting from the characteristic of the professional activity performed by the injured**.**
- **Trajeto** – Are the accidents occurred on the way between the home and the workplace of the insured, and vice versa.
- **DoençaTrabalho** - Are those produced or triggered by the exercise of a work peculiar to a particular area (Annex II of the Regulation of Social Security) and those acquired or activated due to special conditions under which the work is performed and that is directly related to it.
- **SubseçãoD** - Chapter of the publication that provides additional information on Accidents at Work.

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Importance Of E-Government Implementations To Develop Communication And Interaction Between Government And Its Shareholders

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ABSTRACT

The economic, socio-cultural, political and technological developments experienced particularly after the 20th century have reconstructed not only individuals and societies but also the institutions of those societies. The two-way communication to be established with those shareholders who are affected by the activities of the institution and who affect the institution with their activities is an important means of success to ensure quality of service and satisfaction today. Besides, communication is an essential element also underlying the ability of the state to work actively and efficiently. Especially the maximum use of information & communication technologies during the services to be provided by the institution plays a critical role in enhancing communication and interaction between the institution and its shareholders. There are four main groups with which the state communicates and interacts through e-government implementations. They are citizens, enterprises, public servants and public institutions. These e-government implementations appearing between the state and its shareholders are termed in the following way: e-government implementations from the state administration to citizens (G2C), from the state administration to enterprises (G2B), from the state administration to public institutions (G2G), and from the state administration to public servants (G2E). In this paper, the importance of e-government implementations to develop communication and interaction between the state and its shareholders will be addressed and the four main e-government implementations will be examined in terms of the communication process.

Keywords: E-government, shareholders, communication, interaction, feedback

1. INTRODUCTION

Today the traditional government understanding has been replaced by the e-government understanding. A state concept, wherein the state exists for its shareholders and works to provide them with services, underlies this new understanding. E-government is an open, transparent, efficient and non-clumsy government understanding wishing to convey its services more rapidly and to a larger number of its shareholders than does the traditional government and aiming at a communication process whereby it can transfer the opinions of its shareholders to the government process by means of information & communication technologies. At this point, through successful e-government implementations, it becomes easier for the state to improve its efficiency by means of some powerful communication it will establish with the groups it interacts with and by means of the feedback it will receive from them.

Thanks to the Internet - the basic dynamic of e-government implementations, fast communication between a source and a target is performed. The ability of those who are targets of a message sent by the source person or institution to answer and their ability to ask questions enable communication to be interactive [1]. In the traditional state structuring, communication is usually organized to be one-way and it presents a top-down hierarchical structure. In this case, problems are experienced with respect to the sharing of information that results from the participation of citizens in government and government processes. However, since communication is two-way in the electronic medium, it is extremely easy to establish cooperation between the government and the citizen and between the government and the institutions in almost every issue [2]. With the e-government implementations, the above-mentioned shareholders (e-government service users) can directly access information in line with their requests and needs and interact with the related institutions today. At this stage, users can send e-mails to the authorities, enquire any information they wish in the in-site search engines (e.g. tax debt, population registers, bid information, etc.), download various forms and documents used for official procedures or ask for expert assistance [3].

2. BENEFITS OF E-GOVERNMENT

E-Government arrived on the scene at about the time- i.e. during the 1990s-when the public sector reform movement started to stall. E-government is systematic use of ICTs to provide government services in more efficient and more customer friendly ways [4]. The emergences of the Internet and other technologies for electronic commerce has led naturally to development of "e-government", services-the application of information technology combined with changes in agency practices, to develop more responsive, efficient and accountable government operations. E-government is envisioned as providing some of the following key benefits [5]:

- More accessible government information (Information Technology Research, Innovation and E-Government)
- Faster, smoother transactions with government agencies
- Enhanced ubiquity of access to information and transaction
- Greater effectiveness in meeting the needs of specific groups and users
- Increased participation in government by all people, fostering more informed and engaged citizenry
- Greater ability to meet expectations for advances in government-unique areas, including challenges in the new early emerging homeland security mission
- More efficient internal government operation.

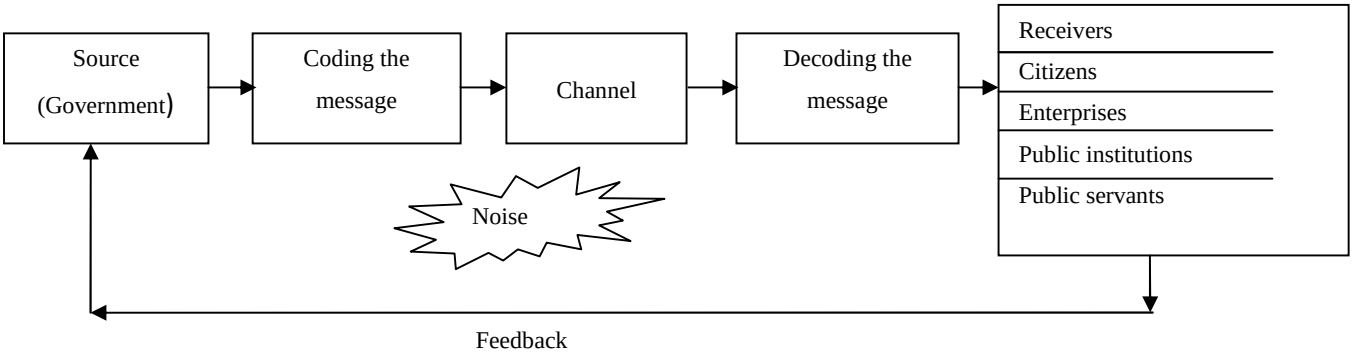
The internet and World Wide Web eliminate boundaries and allow for integrated services to be available 24/7 while promoting faster and efficient connection between agencies, processes and systems[6]. According to Nawafleh et al., benefits of e-government are as follow [7]:

- Cost reduction and efficiency gains: through using all internal and external services online that means decreases the processing costs of many activities as well as will increase the government efficiency.
- Quality of service delivery to businesses and customers:
- E-government means to enable access to all services by using the internet, as well as services online will enhance reducing the bureaucracy process inside the government, improving the procedures and offering fast and convenient transactions.
- Increase the capacity of government: E-government aims to use ICT tools to support organizations to organize their work inside and outside the organization, leading to greater efficiency, effectiveness and further improve the type of services provided in the public sector or the business sector, as well as assistance in making decisions.
- Network and community creation: E-government is seeking to create an atmosphere of interaction between all partners in e-government through the Exchange of information on a network and an integrated and harmonious community

3. E-GOVERNMENT IMPLEMENTATIONS AS A COMMUNICATION PROCESS AND INTERACTION

The successful functioning of communication, which generally means the sending of messages between a source and a receiver by means of some channels, is possible through the fact that all elements included in the process have some features. When e-government implementations are evaluated as a communication process, it is seen that the state occurs as the source, while the receivers are citizens, enterprises, public institutions and public servants. The principal communication channel between the state as the source and the four groups evaluated as the receivers is the information & communication technologies, i.e. a powerful and uninterruptedly functioning Internet network. Successful communication depends also on how well the source knows the features of its target, namely its receiver. The better the state (source) knows the wishes and needs of its shareholders (receiver), the more successful it is in its implementations. This success is possible through a communication process formed by a correct message to the correct target (receiver). Feedback, any reaction returning to the source from the receiver, is an essential element for the source to review itself and determine its shortcomings. The reactions and feedback to be received from receivers in e-government implementations constitute important information for the state as a source that wishes to enhance communication and interaction with its shareholders, for the state as the source in this communication process in fact initiates this communication process and sends messages for the satisfaction by the four groups that are its receivers, i.e. its shareholders. Any feedback to be obtained from receivers will ensure its renewal, improve its quality of service and efficiency and therefore increase the success of e-government implementations in the long term. There are many elements that negatively affect success in a communication process. They are called noise elements. There may be different noise elements in e-government implementations. The primary one is that access to information & communication technologies which make these implementations possible cannot take place equally for everyone. This element appears a digital divide.

Figure 1: E-Government Implementations as a Communication Process



Source: It was adapted by the author.

There are four main groups with which the state communicates and interacts through e-government implementations. They are citizens, enterprises, public servants and public institutions. These e-government implementations appearing between the state and its shareholders are termed in the following way: e-government implementations from the state administration to citizens (G2C), from the state administration to enterprises (G2B), from the state administration to public institutions (G2G), and from the state administration to public servants (G2E). When we evaluate e-government implementations as a communication process, it is seen that the main elements in the general communication process exist here as well. They are the elements of source, coding of the message, decoding of the message, channel, receiver, feedback and noise. When these four implementations, G2C, G2B, G2G and G2E, are evaluated as a communication process, the following are encountered:

The content of the message given by the government as a source varies by the position of the relationship of the receiver with the government and by the content of the service he/she/it needs. For instance, citizens' need to interact continually with the

public institutions from birth to death is the basis for G2C implementations. E-government implementations from the state administration to citizens (G2C): In the process starting from birth, interaction is provided in all areas such as the obtaining of an identity card, passport, tax payments, the tracking of electricity, water and natural gas expenditures on the Internet, driving license, traffic information and fines, the obtaining of various permits and certificates, applications to official institutions and job tracking, marriage, divorce, military service, real estate purchasing, retirement, social security, insurance, education, health, justice, e-election, e-census, e-democracy, communication, interactions with local authorities, weather condition and meteorology information, exchange rates, official gazette, and access to statistical information. The process after death, however, is completed with legal procedures such as funeral procedures, declaration and records of death, succession, inheritance, and title deed [8]. In the e-government implementations from the state administration to enterprises (G2B), regulations such as letting the establishment of companies, tax assessment, carrying out of customs procedures and encouragement for investments can be considered [9]. E-government implementations from the state administration to public institutions (G2G) encompass the electronic sharing and management of data among the public institutions. They can also ensure cooperation, coordination and flow of information and documents among various public institutions in the process that covers both the horizontal relationships among all public institutions and the relationships between central and local authorities [10]. Government to government communication (G-to-G) includes agencies intercommunication, and communications between the governments. The government electronic administration, as the subset of G-to-G, is tasked with guiding the government and supporting it in the process of policy making through application of information and communication technology[11]. E-government implementations from the state administration to public servants (G2E): Providing of human resources training, informing of public servants about every law, regulation and arrangement enacted and ensuring of coordination between the units are the basis for the G2E implementations [12].

When an evaluation is made in terms of the channel, it is seen that information and communication technologies and a strong Internet network are used in all implementations. The receivers are the above-mentioned citizens, enterprises, public institutions and public servants. In this communication process, the ability of receivers to give feedback thanks to the infrastructure of information and communication technologies is the basis for the government-shareholder interaction. Thanks to the new technological infrastructure, receivers get rid of the one-way feature in the traditional state structuring, are able to be included in decision processes, contribute to an increase in the quality and efficiency of the services provided by the government and to their working efficiently, and cooperate with the government at the point of the provision of services they need faster and in a more transparent and democratic medium. At this point, the failure of the technological infrastructure of the government to be strong within its boundaries and the lack of opportunities of access everywhere - in other words, digital divide - appear an element of noise in e-government implementations that we consider a communication process and interrupt the interaction of the government with its shareholders. Besides, the government as the source in this communication process needs staff with knowledge, skill and competence with which they can operate this system in a two-way fashion without any problems. The absence of staff with such features, the failure to make the necessary legal regulations for the operation of this entire process without any problems and the failure to provide adequate security in this process when personal information is shared are an element of noise that will negatively affect the success and efficiency of the process. When we consider in terms of receivers, the main elements of noise that might occur result from the failure of receivers to fully control the content and technique of the system for e-government implementations particularly when analyzing the message and giving feedback. All these elements of noise that might be due to different elements negatively affect the success of the communication process and the interaction between the government and its shareholders in e-government implementations.

4. CONCLUSION

Today the government is restructuring the service production processes especially in line with the development of information and communication technologies and the changing needs of citizens. In all processes for G2C, G2B, G2G and G2E, the bureaucratic procedures between the government and its shareholders have decreased; the service speed has increased; and it has been started to conduct the jobs as being citizen-oriented and in a more efficient and productive fashion. The e-government implementations have restructured the communication between the government and its shareholders and enhanced interaction and cooperation. The implementations based on one-way communication in the traditional government understanding have left their place to faster and more flexible implementations based on two-way communication in e-government. Thanks to this mutual communication which is based on the Internet, the government restructures the service processes in line with the changing needs and expectations of shareholders and is able to meet their requests uninterruptedly. At this point, in order for the process between the government and its shareholders to work effectively, it is necessary to increase the opportunities of accessing the Internet services by forming the technical infrastructure required, to ensure the provision of security conditions by making legal regulations, to increase the number of competent staff, and to form consciousness with respect to the use of e-government by shareholders.

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E-Participation on environment-related policies. An assessment of European local government practices.

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1. Introduction

The advent and diffusion of the Internet has raised high expectations that new electronic tools may increase and improve citizen participation in government decision-making and stop the decline of political engagement and trust in political institutions. Information and Communication Technologies (ICTs) and, particularly, Internet-based technologies, are often considered a potential solution to these problems.

E-participation involves "the extension and transformation of participation in societal democratic and consultative processes, mediated by ICTs" [1]. The OECD [2] has highlighted the lack of systematic evaluation of citizen participation, concluding that there is an "evaluation gap" and that the "evaluation of public participation is still in its infancy" [3]. At the same time, public sector literature has signaled that, in many occasions, public sector reforms or improvement initiatives are more rhetorical than real [4, 5]. Online citizen participation in local democracy depends on the opportunities offered by municipalities [6]. Thus, analyzing the offer of e-participation initiatives and the factors that affect the diffusion of e-participation becomes essential.

This paper brings together two relevant topics: e-participation and climate change. Household consumption patterns and behavior have a major impact on natural resource stocks, environmental quality and climate change. Furthermore, projections indicate that these impacts are likely to increase in the near future [7].

While sustainable development is a global philosophy -Kyoto Protocol 1997; Copenhagen Climate Change Conference 2009-, it also must be related to local issues, and it needs citizens to become involved [8]. In environmental-related activities, the citizens should not only be consulted on governmental action, but they have to make their own contribution by changing their behavior as well (for example, reduction of energy consumption and private motorized transport). A citizen who is well informed on environmental policies and initiatives can himself be part of the global effort for environmental protection. What makes the environmental case even more interesting is that it is a common good and its protection is a right and an obligation for everyone. In this context, the use of ICTs, and particularly the Internet, may have an important role for information, education and empowerment reasons.

In this paper, we analyze the websites of the environment departments of European local governments that have signed the Aalborg+10 commitments. We aim to establish to what extent these local governments are making use of the Internet in order to promote environmental-friendly behaviors among their citizens and offer opportunities for strengthening democracy by creating opportunities for e-participation. Particular attention will be paid to the type of citizen participation being promoted: informing, consulting or active involvement [9, 10]. Additionally, we analyze other contextual factors that traditionally have been used to explain the developments of public sector reform policies. Specifically, this study attempts to answer the following research questions: 1) What is the level of use of e-participation by European local governments in order to promote climate change responsible behaviors among citizens? 2) Are European local governments using the Internet to promote higher levels of citizen participation and involvement or just to enhance transparency? and 3) What factors promote the development of these tools at local level?

2. E-Participation and the environment

E-participation initiatives are seen as tools for new modes of governance [11] and for integrating civil society groups with bureaucracies [1]. Moving towards the network society and engaging with constituents is understood as a critical element of political legitimacy [12]. E-participation aims to support active citizenship with the latest technology developments, increasing access to and availability of participation in order to promote fair and efficient societies and governments [1]. E-participation efforts can take many forms [13] (e-informing, e-consulting, e-involvement, e-collaboration, e-empowerment), which reflect the three categories in which citizen participation is usually classified [2, 9, 10]: information, consultation and active participation (also known as cooperation).

Submitting complaints and proposals was seen as a basic and easy way to implement e-participation, which most governments have offered since the early days of e-government. Nowadays, a wide variety of tools are being used, including discussion forums, blogs, wikis, chat rooms, voting systems, and web and podcasts, in addition to the standard website and e-mail services [14]. Recent developments also include the use of Web 2.0 and social media tools.

Compared to traditional public spaces (i.e. face-to-face public square; political reunions, etc.), online spaces are open public spaces (generally, no

geographical or temporal limitations exist) that allow for a non-centralized communication of many-to-many, where participants are free to express their opinions (in general, no censure and limits to expressing opinions are established) [15]. New media, especially the Internet, provide citizens with enhanced possibilities for gaining information and communicating with politicians, which altogether might potentially lead to a revitalization of the public sphere [16]. In this way, the use of the Internet becomes a very powerful tool to promote sustainable behaviors of citizens and governments. Both need to change the way of doing and planning and both are affected by the actions of the others. Information, consultation and active participation become extremely important in this area, and the use of the Internet can be of great help in order to achieve these three goals.

According to Ostrom [17], collective interventions due to global issues like climate change should not exclusively rely on global approaches, but can also be undertaken on smaller scales. The evolution towards a sustainable community may be achieved by empowering citizens to take responsibility and action for their own 'backyards' [8]. Developing a 'critical consciousness' about sustainability provides a platform for participation; for participatory processes to be successful, all participants need to possess appropriate skills [8].

The Agenda 21 is perhaps the most important blueprint for sustainable development into the 21st century. It goes further than just looking at the environment, understanding sustainability in a broad sense in which social factors are seen as very important as well. Its basis were agreed during the Earth Summit at Rio in 1992, and signed by 179 Heads of State and Government. At Rio an undertaking was given that local councils would produce their own plans - their Local Agenda 21. This would involve consulting with the community, because it is the people in the area who have the local knowledge needed to make sensible decisions for their future.

Focusing on the environment and climate change, the 25th June 1998, in the Danish city of Aarhus, the UNECE (United Nations Economic Commission for Europe) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) was adopted. The Aarhus Convention is a new kind of environmental agreement that: links environmental rights and human rights, acknowledges that we owe an obligation to future generations, establishes that sustainable development can be achieved only through the involvement of all stakeholders, links government accountability and environmental protection, and focuses on interactions between citizens and public authorities in a democratic context (www.unece.org/env/pp/). The Convention is not only an environmental agreement; it is also a Convention about government accountability, transparency and responsiveness.

Local governments are the level of government closest to citizens and have unique opportunities to influence individual behavior towards sustainability through education and awareness rising. Since the Aalborg+10 conference in 2004, more than 600 local governments have signed the Aalborg commitments and the number is still increasing (www.aalborgplus10.dk/). The Aalborg vision envisages "cities and towns that are inclusive, prosperous, creative and sustainable, and that provide a good quality of life for all citizens and enable their participation in all aspects of urban life".

3. Methodology

3.1. Sample and data collection

The sample of our study was defined as European cities, bigger than 50,000 inhabitants that have signed the Aalborg Commitments, but limiting the number of cities studied in Italy and Spain[1]. Bigger local governments were selected for this study as they are usually the most innovative in the adoption of new technologies and, at the same time, they have more need of them, as the distance between the governors and the governed is greater. In this way, our final sample is made up of 67 European cities. The countries covered and number of cities per country are as follows: Austria (1), Belgium (1), Bulgaria (2), Denmark (3), Estonia (3), Finland (5), France (4), Germany (5), Greece (4), Iceland (1), Italy (8), Latvia (1), Lithuania (2), Norway (3), Portugal (3), Spain (7), Sweden (8), Switzerland (2) and the United Kingdom (4).

We have carried out a comprehensive web content analysis of the cities selected. The websites were accessed during February-April 2011, and 134 items were analyzed (see Tables 1, 2 and 3)[2]. Most items included in the websites are rated "1" if they appeared in the website and "0" if not. Some items could be scored 0.5 if they partially fulfilled the coding criteria.

3.2 Dimensions analyzed

We have assessed the level of development of e-participation regarding environmental issues by grouping the 134 items in four different dimensions: transparency, interactivity, usability and website maturity [18]. Most of the items analyzed belong to transparency and interactivity as key dimensions of the study.

Transparency (71 items) on websites refers to the extent to which an organization makes information about internal works, decision processes and procedures available [18]. Transparency is the literal value of accountability: accountable bureaucrats and/or organizations must explain or account for their actions to enhance the level of public trust and legitimacy [19]. **Interactivity** (40 items) is a measure of the degree of immediate feedback and development of possibilities to interact with the environment department of the local government, either through online services or through

[1] In Italy and Spain, the inclusion of all the signatory cities with more than 50,000 inhabitants -136 and 320 respectively- would have distorted the composition of our sample. So, in these two countries only the 5 most populated cities have been included and some other cities with a good reputation regarding sustainability and environmental policies.

[2] Because of space requirements, Tables 1 and 2 only include a summary of the items analyzed. The complete tables with data on individual items are available from the authors upon request.

citizen dialog and e-participation initiatives. **Usability** (9 items) refers to the ease with which users can access information and navigate the web portal [19]. Lastly, **Website maturity** (14 items) embraces those aspects that indicate a high degree of website sophistication.

The partial scores in transparency, interactivity, usability and website maturity have been obtained by adding up the individual scores for every relevant item in each dimension and dividing the total by the maximum possible score in each dimension. The total scores of websites by city (Table 5) have been obtained adding the scores of 'transparency', 'interactivity', 'usability' and 'website maturity' with weights of 40 per cent for the former two dimensions, and 10% for the latter two, because of the relevance of each dimension. Given these scores per city, we have calculated a total score per country, including also the standard deviation to assess the homogeneity of e-participation within each country (see Table 4).

3.3 Statistical techniques

To analyze the data obtained through the website content analysis, we first carried out an exploratory analysis. Research on transparent and open government usually points to two critical success factors [20]: a culture of transparency embedded within the governance system and a transparency "readiness" factor -that is, factors such as technology penetration, the level of technological capabilities of government agencies, and the social and technology readiness of the populace. In order to understand what factors promote the development of e-participation at local level, univariate analysis has been used. The objective was to test the influence of the following factors on the development of e-participation initiatives: the public administration style[3] (as a proxy of the culture of transparency of each local government) and different variables related to the development of the information society (development of e-government and e-participation at central level, e-government use by citizens and internet penetration rate), as proxies for the transparency readiness factor. The population of each city, the human capital index and the level of corruption were also considered as potential explanatory variables. The influence of the public administration style was tested using the Mann-Whitney test (see Table 5), whereas the influence of the continuous independent variables was tested using Pearson correlations (see Table 6).

4. Analysis of Results

On the transparency dimension (Table 1), the group of items related to service delivery ("citizen consequences", that includes explanations and instructions of requirements imposed on citizens resulting from the department activities) is the most developed (83%). High scores are also obtained in general information about environmental issues and information about specific policies and initiatives (almost 75%). Conversely, the items included in "indicators and data about sustainability" and "information about citizen participation processes in environmental issues", which would allow citizens to have access to updated data about the state of the environment and past and future participatory process on this matter, present levels of implementation below 45%. This shows a reduction in the information when it requires greater effort of elaboration or when it is related to participatory processes.

TABLE 1. Transparency dimension.

1. TRANSPARENCY-ACCOUNTABILITY (71)	71.2
1.1. General information about the department (6) Address and telephone, organization chart, number of employees, budget, annual sustainability report, mission statement	67.3
1.2. Citizen consequences (4) Information about environment procedures, instructions on how to complete these actions, searchable index for downloadable forms or forms to submit online, instructions for appeal process for decisions or address of an ombudsman	82.8
1.3. General information about environmental issues (14) Strategic plan for a sustainable city, information about causes and probable impacts of climate change, index for reports and publications, drafts of new regulations regarding sustainability, environmental publications in electronic format for free, participation in national or European environmental networks/projects, Agenda 21 project and information, policies for sustainable local public service delivery, local government sustainable procurement policy, FAQs (environmental topics), environmental glossary, and What's new section	74.5
1.4. Information of specific policies and initiatives (41) CO_2/energy, water, waste management/recycling, air quality, transport and mobility, parks and green spaces, noise pollution	74.3
1.5. Indicators and data about sustainability (3) Sustainability indicators defined, sustainability indicators targets and timeframe, sustainability indicators reported	32.3
1.6. Information about citizen participation processes in environmental issues (3) Information about present participatory processes (online/offline), information about the level of participation and results of past participatory processes (online/offline), information about future participatory processes	43.8

(*) Between brackets: number of items in each dimension.

As regards the interactivity dimension (see Table 2), we clearly see that there is an important drop in the global mean of this dimension (39.2 versus 71.2% for transparency). The group of items related to the possibility of obtaining information from the environment department and the development of e-services are the most developed, with average scores of 68% and 67%, respectively. Only three items have been implemented by more than 90% of the cities analyzed: forms for downloading, online completion and submission of forms and complaint/suggestion boxes. The least developed group of items are those related to the possibility to receive periodic information about environmental topics (30%), existence of projects with online participation or the possibility to joining in

[3] In Europe, five broad styles of public management may be distinguished: Anglo-Saxon, Nordic, Germanic, Southern European and Eastern European countries. The literature on public sector management usually considers that Anglo-Saxon and Nordic countries have a long-standing reputation of public sector reforms, transparency and citizen engagement. On the contrary, Germanic, Southern European and Eastern European countries belong to a more legalistic tradition and have been considered as laggards in introducing some public sector reforms. Notwithstanding, Germanic countries have a long-standing tradition of consultation with social partners [2]. So, a priori, a higher level of development of e-participation can be expected in Anglo-Saxon, Nordic and German cities.

online (9%) and initiatives to participate in sustainability plans (25%). Intermediate scores around 45% are obtained by the subcategories "initiatives to promote responsible behavior" and "initiatives to have a say in sustainability". We again see important variations in the categories, with a great decrease when it comes to fully open the debate to the public (e-rulemaking and e-petitions) and the existence of projects with online participation.

TABLE 2. Interactivity dimension.

2. INTERACTIVITY-CITIZEN DIALOGUE (40)	**39.2**
2.1. Obtaining information from the department (5) Department general e-mail, sub-units e-mail, individual employees' e-mail, searchable database for reports, online request for information or publications	68.1
2.2. Development of e-services (5) Forms for downloading, online form completion and submission, online payments, online appointments with officials or staff, provides link to appeal process	67.2
2.3. Services to provide periodic information (8) E-mail alerts about new reports/news about environmental topics, RSS feeds, SMS alerts about , possibility of redistributing the contents of the web through blogs or social networks, periodic electronic journal about sustainability, information of air quality, water quality and noise pollution updated on the web	29.9
2.4. Projects with on-line participation (or possibility to join in online) (8) CO_2/Energy, Water, Waste management/Recycling, Air quality, Transport and mobility, Park and green spaces, Agenda 21, E-participation processes of last year	9.3
2.5. Initiatives to promote responsible behavior (3) Location of "recycling centers" on an interactive map, simulators (for example, of household electricity consumption), journey planner (public transport)	45.0
2.6. Initiatives to have a say in sustainability (9) Complaints/suggestion boxes (website), chat, asking for opinions about specific topics (by email; forms), e-consultation (short surveys yes/no; specify preferences), e-consultation (long surveys), blogs, web forum, Facebook page or other type of social network	43.8
2.7. Initiatives to participate in sustainability plans (2) E-rulemaking, e-petition system/e-petitions accepted	25.4

(*) Between brackets number of items in each dimension.

Similar results can be found in the usability and website maturity dimensions (see Table 3). Usability and website maturity show a high degree of development in technical items (such as search engine, homogeneity of sub-pages and site map) and those related to service delivery (credit card payments, secure servers for transactions, private areas, digital signature), but low percentages in those items which are able to enhance the accessibility of websites and to bring about social inclusion (such as text only or accessible versions, audio access for the visually impaired, different languages or compliance with international accessibility standards) and other items related to innovation and citizen participation (such as live broadcast of important speeches or events, interactive database of indicators, indicators downloadable in excel format, audio/video files for environment-related activities and possibility to comment on them).

The average total score of the sample is 55.7% (see Table 4), which shows a moderate degree of development of e-participation among the biggest European cities that have signed the Aalborg commitments.

The transparency about internal works and decision processes dealing with procedures to reach environmental commitments is the dimension that scores the highest average value (71.2%). On the contrary, the possibility of citizens to interact online with the corresponding local government department is the dimension with the lowest score, only 39.2%.

TABLE 3. Usability and Website maturity dimensions.

3. USABILITY	**61.2**
3.1 Access in different languages	46.3
3.2 Site map	82.1
3.3 A to Z index (alphabetical order index)	41.8
3.4 Search engine	97.0
3.5 Help section	46.3
3.6 Homogeneity of the different subpages	95.5
3.7 Text-only or accessible version of the website	59.7
3.8 Audio access to the site for people visually impaired	20.9
3.9 Compliance with accessibility standards	61.2
4. WEBSITE MATURITY	**54.4**
4.1 No broken links	77.6
4.2 Last updated within the last month	83.6
4.3 Content arranged according to different topics (versus the hierarchical structure of the department)	94.0
4.4 Credit card payments	85.1
4.5 Secure servers (https://...)	91.0
4.6 Private areas with passwords are used in order to access to personal information	91.0
4.7 Digital signature for transactions	88.1
4.8 Live broadcast of important speeches or events	19.4
4.9 Privacy policy	56.7
4.10 Security policy	41.8
4.11 Interactive database of indicators	4.5
4.12 Indicators downloadable in excel format	4.5
4.13 Audio/video files for environment-related activities	19.4
4.14 Possibility to comment those audio/video files	4.5

From the results reported in Table 4 (the scores of local government websites by country[4]) and the results by city[5], we have classified the countries in three groups, considering whether the cities in each country are above or below the total average score:

1. All cities above the total average score: central and northern European countries (Austria, Belgium, Denmark, Germany, Latvia, Norway, Sweden and the United Kingdom).
2. All cities below the total average score: periphery countries (Bulgaria, Estonia, Greece, Iceland and Lithuania).
3. Some cities above and some cities below the total average score: Southern European countries (France, Italy, Portugal and Spain), Switzerland and one more country that could be consider an outlier among Nordic countries (Finland).

It is worth highlighting the high scores obtained by countries within the first group, being all of them over the average in all dimensions, in particular, Germany, United Kingdom, Sweden and Denmark. On the contrary, in the second group, the countries show very poor figures, being their scores below the average in all the dimensions, in most of the cases. Finally, the countries of the third group combine cities that are within the first positions in the ranking, with other cities

[4] These results have to be taken with caution, as the number of cities analyzed per country differs and in some cases (Belgium, Austria and Latvia) only one city has been analyzed. However, this grouping has been helpful in order to interpret our results.

[5] The individual scores of each city have not been included in the current version of the paper because of space requirements.

that are at the bottom of the ranking. In general, the countries in the first group present the lowest levels of dispersion in the level of development of e-participation on environmental topics, so the cities in each of these countries show homogenous patterns, whereas countries in group 2 and 3 present a high degree of dispersion in the total scores.

TABLE 4: Scores by country.

Country	Trans.	Inter.	Usab.	Mat.	Total	MAX	MIN	σ
GER	93.0	52.5	83.3	58.6	72.4	76.2	71.2	2.2
UK	90.5	50.6	80.6	55.4	70.0	75.3	65.8	5.1
SWE	82.2	51.1	80.6	55.4	66.9	74.2	60.3	5.4
DEN	85.0	47.1	75.9	54.8	65.9	71.1	62.7	4.7
BEL	80.3	41.3	94.4	50.0	63.1			
NOR	78.4	40.8	83.3	57.1	61.7	66.2	59.4	3.9
AUST	73.2	40.0	94.4	64.3	61.2			
LAT	76.1	42.5	38.9	57.1	57.0			
SWI	86.6	33.1	50.0	39.3	56.8	58.3	55.4	2.0
SPA	76.5	34.1	57.9	58.2	55.8	70.2	29.4	11.0
FRA	73.4	34.1	65.3	60.7	55.6	66.5	47.8	8.3
ITA	70.4	35.9	41.7	56.3	52.3	72.4	14.7	17.6
ICE	71.8	31.3	50.0	50.0	51.2			
EST	45.1	36.7	35.2	54.8	51.2	53.8	23.0	16.4
FIN	70.7	29.5	54.4	41.4	49.7	59.4	40.6	7.6
POR	59.6	28.3	48.1	57.1	45.7	68.1	30.4	19.5
LIT	54.9	35.0	50.0	42.9	45.3	53.1	37.4	11.0
BUL	33.1	28.8	38.9	53.6	34.0	34.6	33.4	0.9
GRE	21.1	33.4	40.3	53.6	29.5	39.8	12.2	12.7
TOTAL	**71.2**	**39.2**	**61.2**	**54.4**	**55.7**	**76.2**	**12.2**	**14.6**

Looking at the data of the individual cities, most local governments obtain transparency scores over 75%. On the contrary, the maximum score obtained in interactivity is 65% and only 13 local governments obtain scores over 50% in this dimension. Our results suggest that in the initial steps of e-participation the importance given to transparency, interactivity, usability and maturity is similar, with few differences among them. When the cities want to improve in this regard, they start by improving transparency and usability (the dimensions that require less effort and costs), creating great differences in the developments of these two dimensions in comparison with interactivity and maturity, respectively.

TABLE 5. Mann Whitney tests.

Means	Trans.	Inter.	Usab.	Mat.	Total
Anglo	90.5	50.6	80.6	55.4	70.0
Nordic	78.7	42.6	72.2	51.8	60.9
Germanic	88.9	46.1	76.4	54.5	67.1
South	64.3	34.2	51.9	56.9	50.3
East	48.4	35.0	40.3	51.8	42.6
Mann-Whitney test (asym. significance)					
	Trans.	**Inter.**	**Usab.**	**Mat.**	**Total**
Anglo/Nordic	0.009**	0.152	0.348	0.400	0.044*
Anglo/German	0.729	0.496	0.864	0.790	0.610
Anglo/South	0.009**	0.010*	0.009**	0.762	0.007**
Anglo/East	0.007**	0.017*	0.005**	0.927	0.007**
Nordic/German	0.006**	0.541	0.504	0.362	0.154
Nordic/South	0.185	0.031*	0.001**	0.098	0.013*
Nordic/East	0.000**	0.169	0.000**	0.678	0.001**
German/South	0.001**	0.011*	0.006**	0.702	0.005**
German/East	0.001**	0.082	0.003**	0.664	0.001**
South/East	0.054	0.844	0.086	0.399	0.116

Note: ** Differences statistically significant at the 1% level;
* Differences statistically significant at the 5% level.

Table 5 shows the average e-participation indexes in the 5 public administration styles and the results of the Mann-Whitney test of difference of the means among them. As can be seen, Anglo-Saxon and Germanic cities are those which present the highest e-participation indexes (with no significant differences among the two groups). Nordic cities present slightly above-average scores, whereas Southern European cities present slightly below-average scores. Lastly, Eastern-European countries are those presenting the lowest scores.

Table 6 shows the results of Pearson correlations among the continuous independent variables selected and the e-participation indexes elaborated. The results obtained indicate that in those countries where the level of development of e-government and e-participation at central level is higher, local governments obtain higher indexes in the e-participation indexes elaborated. Likewise, the relationship between the corruption rate and the participation indexes elaborated is also significant. The corruption figures range from 0 (highly corrupt) to 1 (highly clean). So, these results suggest that the less corrupt the country is, the more developed e-participation is at local level. Finally, the two variables related to the level of access of citizens to the Internet and the level of use of e-government by citizens are also statistically related to higher levels of e-participation

TABLE 6. Pearson correlations.

	Trans.	Inter.	Usab.	Mat.	Total
Log population	0.228	0.099	0.013	0.387**	0.207
E-gov central	0.399**	0.214	0.496**	0.120	0.399**
E-part central	0.321**	0.247*	0.403**	0.145	0.352**
Human capital index	-0.014	-0.063	0.064	-0.057	-0.025
Corruption	0.532**	0.324**	0.590**	-0.101	0.413**
E-gov use by citizens	0.410**	0.310*	0.472**	-0.054	0.418**
Internet penetration	0.514**	0.404**	0.596**	-0.07	0.533**

Note: ** Significant at the 1% level; * Significant at the 5% level.

5. Discussion and conclusions

We aimed to analyze the level of development of e-participation in European local governments in relation to environmental topics and climate change and the factors that explain the level of development of these practices. In general terms, the use of e-participation in climate change is still in its infancy. A total average of 55.7% among cities that have shown a public interest in climate change topics (Aalborg signatories) shows a low level of development in this area. This suggest that becoming a signatory of the Aalborg commitments not always fosters the development of e-participation in environment–related topics and that there are other variables that need to be studied to understand the developments in this area. In this sense, it could be argued that the signature of the Aalborg commitments in some cases becomes a window dressing behavior in order to show an image of modernity, global citizenship, and commitment towards the environment and citizen participation, but without promoting significant changes in government to citizen relationships.

Additionally, we aimed to see if e-participation in climate change was being used only to inform citizens about policies and practices (transparency) or also to promote debate and active participation (interactivity). Our results show that, similarly to other citizen participation studies [21], the developments on e-participation are higher in those areas related with giving information to citizens. It is noticeable that when this information requires a greater effort for the local government, the level of disclosure decreases.

Our results suggests that local governments show a positive behavior towards e-participation in climate

change when the information to be disclosed can easily be obtained or the tools to be used do not require much effort on the part of the local government. Nevertheless, the offer of *real* participative projects, up-to-date indicators or e-petitions initiatives, among other initiatives to promote e-participation regarding environmental policies, are hardly developed.

So, the creation of a true e-dialog seems to be still a pending issue for European local governments fighting against climate change. If this seems to be the case even in local governments actively committed to promoting citizen participation in environmental topics, the general situation among local governments is very probably to be gloomier than our results show.

Traditionally, the public administration style has helped to understand the differences in public sector reforms [18]. We have seen that this classification is also useful to explain differences in e-participation related to climate change, being Anglo-Saxon, Nordic and Germanic cities among the leaders in this regard. According to our results, German cities are also among the leaders in this area, which is usually the case in e-participation [21], but not in other public sector reforms [22]. Southern and Eastern-European countries showed the same low-adoption rate typical for other public sector reforms. The comparison among countries suggests two types of behaviors: those countries with similar behavior within them and others with great variations. The greater variations are in those styles with lower levels of development, where some *islands of innovation* can be found.

In addition to the public administration style, we have looked for other explanatory factors. Our results have shown that the development of e-participation regarding environmental topics seems to be related to the level of development of e-government and e-participation at central level, the level of corruption, the level of access of citizens to the Internet and the level of use of e-government by citizens. In this way, the theoretical claims that indicate that the Internet is going to foster a revitalization of the public sphere must be taken with caution. Some advances have been observed, but to date they are mostly limited to those countries and cities with higher levels of transparency and penetration of ICTs and a culture of citizen engagement. So, it does not seem feasible that the Internet is going to lead to a revolution in government to citizen relationships or a convergence in governance styles and decision-making structures (at least in the short term).

Acknowledgments: This study has been carried out with the financial support of the Spanish National R&D Plan through research project ECO2010-17463 (ECON-FEDER) and of the European Science Foundation/ European Collaborative Research Projects through the project EUI 2008-03788.

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E-LEARNING IN RURAL AREAS - GERMAN PERSPECTIVE

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ABSTRACT

Globalisation, the accelerating development of new information and communication technologies and the increasing dynamics of markets place new demands on knowledge transfer. Of particular significance in education is the use of e-learning, learning based on new information and communication technologies. Due to its independence of time and location, e-learning is viewed as an opportunity to overcome spatial disparities in knowledge management, in particular between urban and rural areas. In the context of a European network project nationwide surveys were undertaken, in order to study the use of e-learning in the field of further education and to analyse the e-learning market in Germany, in terms of both supply and demand. The surveys addressed e-learning providers, e-learners and a control group in order to describe the e-learning market in Germany and to identify problems which impede the access to e-learning especially in rural areas and particularly do not allow rural inhabitants to benefit from the advantages of e-learning. Different aspects of e-learning provision are shown, especially in terms of specialisation and innovation, as well as obtained benefits and identified learning needs from (potential) e-learning participants.

Keywords: continuing vocational education, e-learning, rural development, e-learning market

1. INTRODUCTION

Lifelong learning and the promotion of qualifications and competences are decisive framework conditions for the economic development and sustained competitive strength of enterprises. Technological and economic restructuring makes new demands on the imparting of knowledge. In particular, further vocational training is of increasing importance not only in the course of technological and economic structural change, but also in view of demographic change. In the context of education and Knowledge Management the use of new information and communications technologies (ICTs) plays a central role in promoting sustainable development. To meet the demand for further training and education from various occupational groups and sections of the population, mainly in rural areas, an efficient educational offer must be ensured. Consequently, special importance is attached to e-learning, a new type of learning in the educational sector based on new ICTs. Because it individualises the learning process and is independent of time and place of learning, e-learning offers the opportunity to bridge the digital divide and surmount spatial disparities, not only between countries, but also between urban and rural regions within each country. "e-ruralnet – network promoting e-learning for rural development", a project co-financed by the European Commission (including ten other EU countries, with project coordination in Greece), is dealing, within the scope of the "Programme for Lifelong Learning", Transversal Projects-ICT, with e-learning as a perspective for rural areas, and at the same time focusing on the needs of small and medium enterprises (SMEs), micro-enterprises and self-employed persons, but also of job seekers. One aspect of the project was analysis of the e-learning market, in terms of both supply and demand. In this connection, a nationwide survey was undertaken in order to establish the supply of and demand for e-learning in the field of further education, especially in rural areas.

2. METHODOLOGY

Within the period January 2010 to February 2011 surveys of e-learning providers, e-learners and a control group were conducted throughout Germany in order to investigate the supply and demand of e-learning in the further training and education sector. The focus was directed to non-formal and informal learning conceptions. Within the scope of a quantitative research method, three online-based questionnaires for each target group were provided through an internet platform. The advantages of this kind of questioning are, in particular, those of time and cost [1]. In the course of the online-based survey, little readiness to cooperate was shown by those questioned, which led to a low rate of return and high rate of breaking-off. As a consequence, paper-based questionnaires were used in the scope of the survey of e-learners and the control group. 183 e-learning providers constitute the data basis of this study, of which 153 (78.7%) were already active in the e-learning market (ex-post analysis) and 39 (21.3%) planned to start in the near future (ex-ante analysis). The survey of e-learners, i.e. persons who had participated in a further training course based on e-learning, was done through the organisations offering e-learning that had participated in the provider survey. The control group consists of persons with no previous experience of e-learning. For the e-learners survey a total number of 102 responses have been included in the analysis and for the control group 107 responses.

The data are analysed within the framework of a descriptive analysis. Usually a significance level is called a significant result when the significance level $\alpha \leq 5\%$, or is called a highly significant result with $\alpha \leq 1\%$. The significance level $\alpha \leq 5\%$ is labelled with (*) and $\alpha \leq 1\%$ with (**).

A $\chi 2$- statistical test was carried out for nominal scaled data in combination with methods of testing for the correlation measures. Cramers V and ϕ-coefficient (in case of a 2*2-matrix) are used to measure the association in contingency tables. The correlation coefficient has been calculated for ordinal scaled data by using Spearman rank correlation and for interval scaled data by using the Pearson product moment correlation. In case of binary variables the ϕ–coefficient is identical with the Pearson product moment correlation. All correlations are labelled with "r". The correlation coefficient is a usual applied effect size, which can be interpreted as follows: r=0,5 as a strong effect, r=0,3 as a medium effect and r=0,1 as a small effect [2]. Additionally a one way analysis of variance (ANOVA) has been calculated to test significant differences of group means, which is labelled with F.

3. RESULTS

3.1. E-LEARNING PROVIDERS

The further education sector in Germany is characterized by a comparatively little regulation by the government, competitive character of the free continuing training market, pluralism of training providers and multifunctionality [3]. The majority of e-learning providers (72.1%) represented in this survey are privately operated, 15.6% are public organisations and 12.3% NGOs. On the basis of present findings, it can be concluded that the German e-learning market is a growing market. About 42.1% of the e-learning providers had been providing e-learning courses less than five years and 21.3% of continuing education providers were planning to start providing e-learning courses in the near future. Only 36.6% of providers had long term experiences offering e-learning for more than 5 years.

The size of providers and e-learning activity was measured by the number of teachers and trainers employed, students participating in e-learning courses and the number of e-learning packages currently offered. Half of the e-learning providers employed 25 or less teachers (median=25). Almost a quarter of the providers (22.4%) employed more than 100 teachers. The mean value of employed teachers is 106.05 and the standard deviation is 230.60. Obviously, a low number of large e-learning providers has upward biased the mean and employed a lot more teachers than other providers. A reason for this result could be caused by the decreasing number of permanent employment contracts and the increase of temporary contracts. Particularly affected are full-time teachers who are replaced by freelance staff [4]. Additionally, providers preferred to employ teachers part-time. About 70.9% of all providers employed ten or less e-learning teachers who are actually involved in e-learning and 83.5% employed 20 or less.

The number of e-learning students which had been instructed through e-learning courses during the last 12 months range from 0 to 20,000 with a mean value of 1073.96, a standard deviation of 2801.11 and median of 102.50. 50 % of the providers had 103 or less students. Here again, a small number of large providers has upward biased the mean. The percentage of female students has a mean of 48.05% and a standard error of 2.201. The gender differences seem to be marginal in this survey, although other studies in Germany have shown that women are significantly under-represented in the context of on-the-job training [5].

The number of e-learning packages currently offered range from 0 to 1000. The mean value of e-learning packages is 33.08 and the standard deviation is 106.91. Half of the providers provided 6 or less e-learning packages (median=6). And again a low number of large providers influence the mean.

The number of e-learning teachers are strongly correlated with the number of teachers employed (r=0.778**), the number of e-learning packages currently offered (r=0.279**) and the number of e-learning students (r=0.197*).

The specialisation of the further training and education provider in e-learning can be expressed by the number of e-learning courses offered within the total training output. About a quarter (22.7%) of the providers that provided e-learning courses during the last 12 months had a proportion of e-learning courses more than 80% of the total output. These organsiations can be regarded as specialised e-learning providers. The majority of e-learning providers (50.8%) were non-specialised e-learning providers that supplement their traditional learning and delivery mode with e-learning. About a quarter (26.5%) ranges between these two ends of the scale (Fig.1).

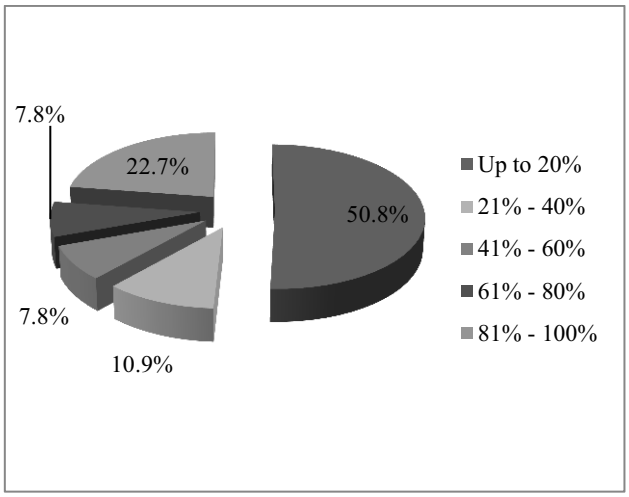

Figure 1: E-learning courses as % of total training output

It is not surprising, that the specialised e-learning providers have a significantly higher proportion of e-teachers in their organisations F(4.99)=10.584**, f=0.65.

The rural orientation of e-learning providers was measured by the provision of special e-learning packages for rural areas. The majority of e-learning providers (84%) do not target rural areas specifically, because they do not provide special e-learning packages for rural areas. They do not differentiate between urban and rural areas and offer their standard e-learning courses to various occupational and population groups irrespective of their place of work and residence. About 16% of the providers target at rural areas. But they do not significantly differ in their organisational structure from other providers.

Rurally orientated providers tend to offer more specific learning content from the area of the primary sector (r=0.308**), highlighting the importance of this sector in rural areas. Taken as a whole, business management subjects and ICT-related subjects clearly dominate the content of e-learning courses (Fig.2).

After successful completion of an e-learning course, certificates of the provider are acquired by students in 81.4% of cases. In addition, 21.6% of providers offer nationally recognised certificates, and 16.5% internationally recognised certificates; only 18% of providers offer formal qualifications Providers targeting rural areas significantly more frequently offer national recognized certificates (r=0.168*).

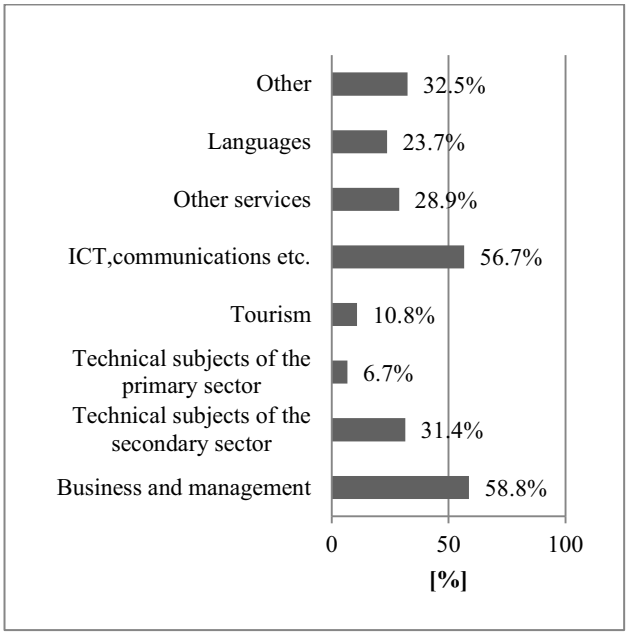

Figure 2: Subjects included in e-learning courses

Different modes of e-learning delivery are used, such as e-learning self-administered by the student, e-learning tutor-assisted or blended learning, a mixture of e-learning and face-to-face learning. Blended learning is the most preferred option by e-learning providers (79.2%). E-Learning self-administered by the student can be found significantly more frequently as a delivery mode in organisations targeting rural areas (r=0.193*). Almost 80% of the rurally oriented providers use a delivery mode supporting self-administered studies of the student, representing nearly 50% of the sample. Correspondingly, pedagogical methods, such as GBL or interactive content and animations (r= 0.175*), are preferred. These methods offer the possibility of a non-personal interaction and support a self-administered study.

In terms of pedagogical methods used, the providers selected on average between 4 and 5 of the given 11 alternatives (incl. open question "Other"). The preference of "traditional" pedagogical methods like text reading (79.2%), powerpoint presentations (57.6%), e-mail attachments (40.3%) or link to websites (52.1%) is evident. This is confirmed by the fact that the majority of the providers (84.7%) use more conventional tools supporting asynchronous communication forms such as e-mail and discussiongroups (63.9%). Tools to support collaboration, such as e-learning communities, register only 33.3% and synchronous communication forms like chatrooms and videoconferences via webcam 54.9% and 30.6% respectively. The e-learning providers choose on average between 3 and 4 items of the given 8 alternatives (incl. open question "Other") in this category.

Organisations with a higher degree of specialisation are more likely to assess their e-learning courses as innovative. In part this can be confirmed using the data by type of technologies and tools used. Conventional e-learning delivery pedagogies such as Power Point presentations are used more in less specialised organisations, while more "innovative" tools like blogs, wikis and e-learning communities are used more in specialised organisations.

E-learning plays a particularly important role in the context of vocational training and can help to improve the competences and qualifications of different target groups. Providers were asked to indicate the priority of different subgroups within these two categories on a five-level evaluation scale (1=No Priority, 5=Top priority). Irrespective of location and branch of industry, the workforce, especially employees in enterprises (mean value=4.34) and self-employed persons (mean value=3.46), are very important target groups for e-learning providers. Among companies, large-scale enterprises (mean value=3.58) and small (mean value=3.42) and medium sized enterprises (mean value=3.69) are the most important target groups. SME´s and micro companies located in rural areas or small towns are expected to play an important role as target groups for rurally orientated providers. The results of this study do not verify this hypothesis.

Providers were asked about their opinion on problems of access to e-learning, particularly in rural areas. The providers have selected on average two items of the given alternatives. From the view of the e-learning providers primarily an insufficient technical infrastructure (57.6%) and IT illiteracy (35.4%) are stated as main problems for access to e-learning in rural areas. Other problems such as lack of support staff in rural areas for rural entrepreneurs and employees, the limited financial capacity of rural residents and entrepreneurs, as well as no available public funding and no suitable training course materials, play a secondary role. There is a highly significant correlation between the items „No suitable infrastructure „ and „IT-illiteracy"(r=0.253**). Additionally the open question "Other" is negatively correlated to the items "No suitable infrastructure" (r=-0.319**) and "Limited financial capacity for rural residents and entrepreneurs" (r=-0.187*), which could be an indication for missing or opposing alternatives. Analysis of the qualitative data of this item points to a lesser extent to structural problems, but rather to subjective reasons. In most of the cases the providers mentioned lack of experience concerning the problems in rural areas, lack of acceptance and a missing additional benefit of e-learning compared to conventional learning courses (Fig.3).

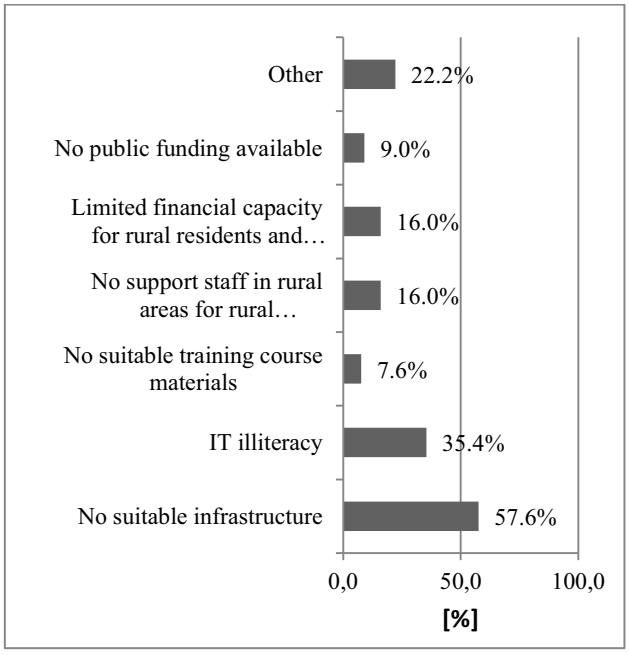

Figure 3: Main Problems associated with e-learning in rural areas

With regard to the quality of further education, it is necessary to ensure that (further) learning opportunities are equal for all people irrespective of place and level of education. Easy-to-use e-learning courses can increase levels of access, motivation and acceptance among users. Providers should judge different individual qualities of the e-students for a successful completion of their e-learning courses on a five-level evaluation scale (1=No Priority, 5=Top Priority). From the viewpoint of the providers, e-learning can particularly benefit persons with a high potential for self-discipline and willingness to learn (Fig.4).

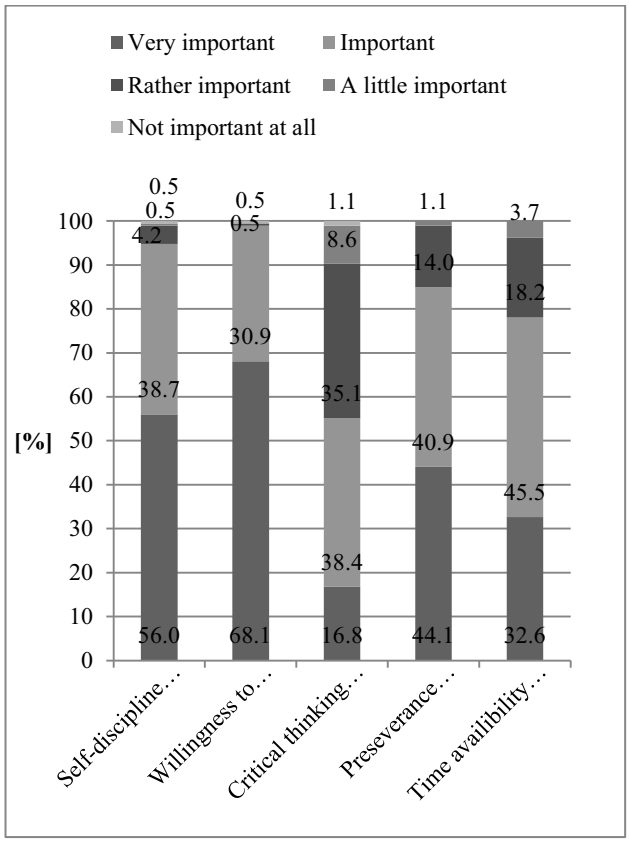

Figure 4: Providers expectations from students

Therefore the participants should have or acquire specific competences for self-directed and self-organised learning.
Mean values of the item "Time availability" differ significantly when data is grouped according to rural orientation (F(1.137)=4.636*, f=0.185). Providers targeting rural areas rate the item "Time availability" lower (mean value=3.71) than other providers (mean value=4.10).
Analysis of the e-learning market in which the demand side is taken into account will follow in the next chapter. In this, the needs, difficulties and problems of learners will be identified.

3.2. E-LEARNERS AND CONTROL GROUP

The main reasons for e-learners and control group for the participating in a further training course are primarily connected with vocational education and training, and relate to learning important for their occupational perspectives in the company or the labour market. 60.8% of the e-learners stated that they participate in an e-learning course in order to do a better job and to improve their career prospects and 34.3% wanted to increase their chances of getting a job or changing their job; the same in the control group with 52.3% and 39.3% respectively. For e-learners, particularly for the survey participants more than 35 years old, the acquisition of knowledge for everyday use also plays an important role, which is significantly higher in the e-learners group (45.1%) than in the control group (19.6%). Besides their professional ambitions, personal reasons are also a focus of interest for e-learners. This can be interpreted as an indicator of the particular interest in further education (Fig.5).

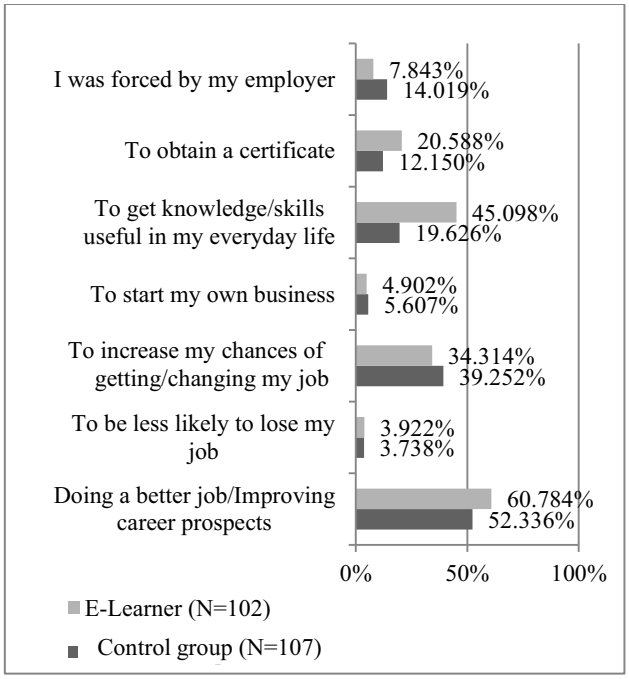

Figure 5: Reasons for selecting the recent training course

In terms of the skills needs of the participants, the improvement of business and ICT skills, as well as technical skills in connection with the secondary economic sector was most frequently stated by both, e-learners and control group. E-learners confirm the results of the providers survey concerning delivery methods, tools and pedagogies used. About half of the e-learners (52%) regarded the methods and tools used on the most recent e-learning course as innovative, the other half (48%) did not.
A higher benefit from participation in a continuing education course is more likely to be found in the control group, although in both groups the actual benefit focuses on the area of fostering personal interests. Measurable benefits like a salary increase or promotion at present job are infrequent. The relatively high number of respondents in both groups who have gained no benefit from their further training course so far, and do not expect any benefits, is rather surprising. The share of e-learners in these response categories is slightly higher (24.51% for e-learners compared to 19.63% for the control group) (Fig.6).
It seems that the e-learning courses have a lower orientation to the (vocational) needs of the participants. E-learners and control group were asked whether they actually use what they have learnt. The majority of the respondents use the knowledge acquired frequently or occasionally. About half of the control

group (49.04%) use the newly acquired knowledge a lot, while for e-learners the share is lower (35.64%).

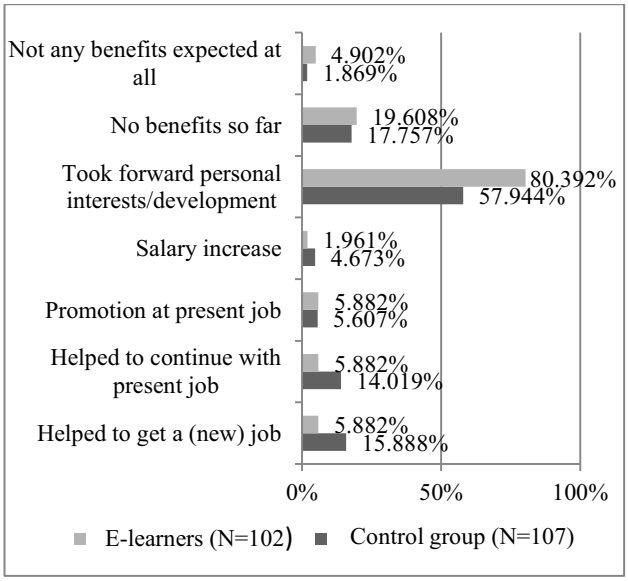

Figure 6: Benefits from the recent training course attended

However, e-learning does not meet the expectations of all participants. Although the majority of e-learners felt that their learning needs have been fulfilled by the e-learning course (67.7%), a relatively high proportion believe otherwise (32.3%). The results of our study show that learners have a strong desire for social interaction, such as with tutors or other learners. Improvements suggested by the e-learners were mainly to do with interaction and communication such as group-work with other students (34.3%) or more intensive support from the tutor (32.4%). Additionally a more demand-matching course content offer, more oriented to the needs of the learners, (30.4%) was mentioned. Each e-learning concept must be adapted to the specific target group. Interestingly the items „More support by tutor“ and “Better content, more relevant to my needs” are negatively correlated to the items „More modern/innovative learning tools“ and „Other“. The open question “Other” contains additional views and information of the respondents, such as more face-to-face learning, better professional support, more practical relevance and the wish for deep-going contents (Fig.7).

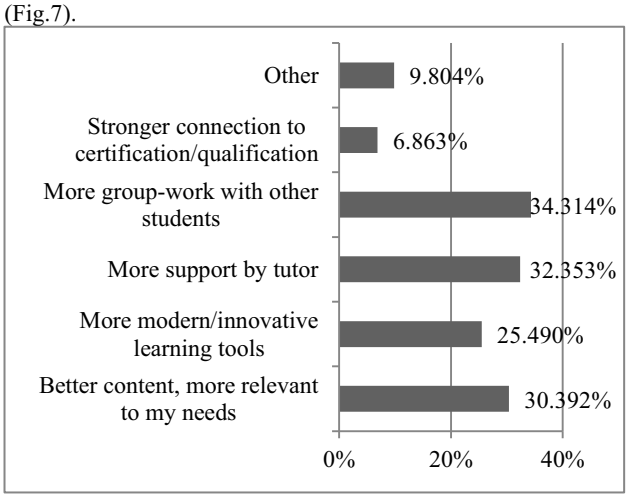

Figure 7: Suggestions for improvement of e-learning courses

Furthermore, e-learning seems to be less motivating than conventional courses for a relatively high proportion both of the e-learners (42%) and of the control group (63%). In this context, blended learning appears to be the most promising e-learning delivery mode.

Most of the participants (61.8%) had no problems in attending the e-learning course, especially with regard to their IT skills and usage of the courses. About 94% of e-learners found the applied methods and tools on their most recent e-learning course easy to use. The main perceived problems in connection with participation in the e-learning course were lack of time (30.4%) and lack of self-discipline (11.8%). Within the framework of the control group survey, lack of time (28.1%) and the high cost (28.1%) were given as the main reasons for previous non-participation in a further training course.

In both groups, further training is mainly financed by the participant or by the employer. E-learners more often paid their courses, while the control group more often received public subsidies (Fig.8).

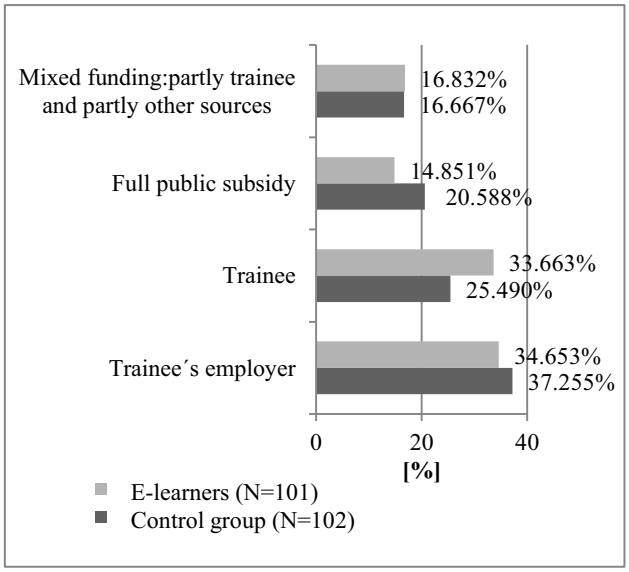

Figure 8: Funding of e-learning courses

For both groups the internet and the employer seem to be by far the most important information sources for finding a suitable further training course. In most cases a broadband connection seems to be an absolute precondition for participating in an e-learning course (affirmation by 67% of the respondents). Although only a small percentage of the survey participants stated an insufficient internet connection as a problem when using the e-learning course, it must be pointed out that particularly in villages and small towns an insufficient technical infrastructure seems prevalent. Those people living and working in rural areas more often stated that they do not have an appropriate technical infrastructure (r=0,336**). From this it can be assumed that broadband internet access in these areas is not as strongly developed as in cities. A further problem mentioned by the control group, is the IT illiteracy of the participants and their lack of the skills to use these latest technologies.

But finally it has to be stated that the majority of e-learners (98%) have a positive opinion of e-learning and would be well prepared to participate again in an e-learning course. The control group, however, have a more pessimistic attitude to e-

learning due to their lack of experience of it. Only 66% would be prepared to participate in an e-learning course.

8. CONCLUSIONS

E-learning is an established form of both core and supplementary learning in many contexts in the area of further education in Germany focusing on vocational education and training. It covers a wide range of technological developments in the field of new ICTs and different organisational forms of learning. The results of the survey show that the German e-learning market is a growing and fast developing market, in which private and smaller organisations offering e-learning dominate. An indication for this growth is the high number of providers who planned to enter this market in the near future and the high number of specialised e-learning providers in this area.

Another aspect is the rural orientation of e-learning providers measured by the offer of special e-learning packages for rural areas. Providers targeting rural areas are characterized by the subjects provided and the e-learning delivery mode.

The existence of an adequate technical infrastructure is a prerequisite for the use of e-learning. This also applies to the so-called offline learning opportunities known as computer-based training (CBT). These e-learning applications offer spatial and temporal flexibility of learning, but usually allow no personal interaction, for example, with tutors or other e-learners, as in network- or web-based training (WBT). But an insufficient technical infrastructure is still stated as the main problem and constraint for the use of e-learning in rural areas. E-learning providers and control group described as a further problem the IT illiteracy of participants and their lack of skills to use these latest technologies. Therefore the digital divide still seems to be an issue in Germany.

However, e-learning does not meet the expectations of all participants, although the respondents have a (more or less) positive attitude towards e-learning. It seems that the e-learners are not able to take full advantage of e-learning. E-learning does not always sufficiently fulfill the existing learning needs and the benefits of e-learning are not clearly visible for the (potential) participants.

E-learning makes an important contribution to the promotion of lifelong learning and can help to improve rural development. The requirements necessary for this appear auspicious, but further improvements are still needed.

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Developing Social Media Communication Skills of Students in Higher Educational Institutions –Reflections from conducting an Online Course

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ABSTRACT

An online course namely 'Social Media Tool Kit for Effective Communications' was carried out in the summer of 2011 for the students (N = 50) of three different Applied Sciences Universities in Finland. The objective of the course was to guide the students to understand the importance of social media communication tools and to learn to how to use them in their personal and professional communications. The course was conducted entirely online, using virtual conferencing, social networks and an e-learning platform. The implementation consisted of seven online meetings with the teacher and seven mandatory learning tasks. The-learning tasks focused on creating personal profiles, online interactions, using bookmarking and mind mapping tools, visiting virtual worlds, making photo stories, publishing in blogs and wikis and using e-portfolio tools. A survey was conducted on the e-learning skills and social media skills of the students before and after the implementation of the course. In this paper we discuss the impact of the course on the students' e-learning skills and knowledge on social media tools. The challenges in learning virtually and points for improvements for conducting online courses are also discussed. The shared outcomes and the research findings from this article are useful to people who intend to use or already using social media techniques and tools for teaching.

Keywords: e-learning, social media tools, communication tool kit, interaction in virtual learning, teaching online

1. INTRODUCTION

The transition from personal communications to professional communication is an important stage in students' professional growth. In a rapidly growing social world, communication in social networks and skills to use a wide variety of web 2.0 based tools have become inevitable. Though guidance and support in terms of tools and learning materials are available in plenty for the use by the students it was observed that, their awareness on these tools remain inadequate. After a number of discussions with the teachers and interactions with students, the need to bring out a course on social media tools was realized in order to improve their knowledge on conduct and behavior in social networks, information security rights and utilization of an array of freely available tools for communication. This article is based on the challenges, outcomes and reflections on designing and conducting an online course namely 'Social media tool kit for effective communication' for the students of three different Applied Sciences Universities in Finland. The observations by the authors are from the first part of an action based iterative studies on developing the social media communication skills of students in higher education.

2. DESIGN OF THE STUDY

The developmental study design is discussed in three parts which are presented below;

2.1. The content of the course

The course was designed in December of 2010 and was implemented in the summer of 2011 as an online course. The course carried 5 ECTS and it was open to students of all the disciplines and did not include any specific skill set as eligibility criteria. The course had the general objectives of, i. learning about and becoming familiar with selected social media tools for different types of communication and ii. understanding the features of tools and applying them for personal and professional communication. The specific objectives included, i. knowing about various social media tools that exist for communication, ii. personal and professional use of selected tools for communication and collaboration, iii. awareness on information security and copyright issues in content creation in social media and iv. evaluation of the new methods of social communication and collaboration.

The course had seven mandatory learning tasks with specific learning objectives.

Learning Objectives	Learning task
1.Efficient personal communication	Creating personal profile using an online tool & sharing
2. Making use of publishing platforms	Wiki/Blog entries on social media for professional communication
3. Efficient use of Video/Photo sharing tools	Interviewing friends on their social media usage & presenting in the form of videos or photo stories
4. Interaction using video conferencing tools	Evaluating the social media strategy of an organization & presentation through video conferencing
5. Learning about bookmark sharing tools	Bookmarking with tagging using a shared bookmarking tool
6. Understanding of virtual worlds	Essay after visiting the virtual worlds & sharing using document sharing tools
7. Evaluation of communication tools & presentation	Learning diary entries with personal communication tool kit

Table 1: Learning Tasks

2.2 Tools for course implementation

Conole (2010), expressed concern that the uptake and use of Web 2.0 sites such as blogs, social networking and wikis by teachers for sharing and discussing practice has being marginal so far. With specific consideration to harness the interesting features of a variety of tools, the course was implemented using a combination of tools, which are listed below.

2.2.1 E-learning environment

An advanced Moodle like e-learning Management System (LMS) called Optima was used as the main platform for the implementation of the course. Optima provided features like shared writing, audio and video recording, multimedia file uploading, electronic dairy, chat, discussion list, survey, personal folders etc., The-learning materials, learning tasks, instructions and feedback discussions were communicated using Optima. Students were given their personal folders and e-diaries. Group discussions were initiated in the discussion lists on their learning tasks and return folders for uploading assignments were provided in Optima.

2.2.2. Web conferencing

Seven online interactive sessions were conducted using Adobe Connect web conferencing technology. Chatting to the teachers and among groups was encouraged with the intention of sharing comments and questions during online lectures. Individual and group presentations in Adobe Connect were made part of the e-learning activities.

2.2.3 Social Network

A closed group was created in the social network Facebook to initiate informal discussions among the students and the teachers. Facebook was also used to post quick updates and announcements. The students were encouraged to add useful links and to interact with one another.

2.3. Survey

Two surveys were conducted among the students using e questionnaires. The international ICT literacy panel (2007) pointed out the need for ICT literacy surveys to understand the digital divide in terms of literacy and effective performance, that is, the extent to which the students and adults are able to use and successfully integrate technology into their lives and work. The first survey focused on the self- evaluation of the e-learning skills of the students. The questions were on the access, use, application and skills in training of various ICT tools. Information on their experience in participating in online courses and use of e-learning environments were also gathered. 30 out of the 50 students who enrolled for the online course responded to the survey.

The second survey focused on the following attributes;

- Awareness/knowledge on important concepts in social media communication
- Skills in using 18 different tools for communication suggested for use during the course
- Evaluation of the tools used in the implementation of the course
- Best and worst practices observed in the course implementation
- Self- evaluation and evaluation of the teacher

25 out of the 50 students enrolled for the course responded to the survey and assessed their skills and knowledge before and after participation in the course. The assessment followed a 5 points scale given below:

- (1) I do not know how to use it
- (2) I know the basic principles and I can use some of the basic features
- (3) I can use most of the features properties to my benefit
- (4) I can use the advanced features very well and I will be able to offer advice to others
- (5) I can use it professionally and creatively. I am able to train others also.

3. RESULTS AND DISCUSSIONS

The findings from the surveys and the observations by the authors are discussed below.

3.1. E-learning skills

Category	Students without experience /Skills	Students with skills to train others
Privacy & ethics in social media	3(12%)	12 (40%)
Information security	5(17%)	8(27%)
Copyright	6(20%)	8(27%)
Educational projects online	8(27%)	8(27%)
Online team working	9 (30%)	9(30%)
Online discussions	9 (30%)	9(30%)
Audio, video, picture sharing	13(43%)	13(43%)
E-library services	13(43%)	13(43%)
Peer review online	9(30%)	9(30%)
E-diary/ E-portfolio	13(43%)	9(30&)
Getting online guidance/tutoring	11(37%)	11(37%)

Table 2: E-learning skills of participants

The survey on the e-learning skills showed that one third of the respondents did not have any experience in participating in any online courses before this course, while one third of them had participated in 1-5 online courses. Almost all (97%) of them had access to computer and internet either at home or work or study place. More than 50% had access to broadband. More than 90% of the students had laptops and had used an USB flash drive to store the data. Gadgets like mobile phone with internet and music player were also seen in use by more than 30% of the respondents. However, the use of DVD/CD writer and e book readers were found to be very less (less than 20%). Two of the respondents had not previously used the audio and video conferencing systems and one respondent have not had used any mobile devices.

Use of tools	Number of students
Mobile devices	7(24%)
Web conferencing tools	9(30%)
Instant messengers	15(50%)
E-learning environments	26(87%)
Social networks	21(70%)
E-book reading tools	6(20)

Table3:Previous experience/ skills in using online tools

The assessment of experience and skills in knowing and using various tools showed that the respondents were a mixed group with different levels of skills. The number of students without experience in working in online teams, multimedia sharing, using e-library services, online peer reviewing and getting online tutoring equaled the number of students having good skills enough to train others in the same attributes.

3.2 Awareness and knowledge

Before their participation in the online course, Facebook and Skype were the main tools mentioned by the students as the most used social media based tools for their social communication. Close to 50% of the students rated their awareness in the scale of 2 when it came to their knowledge on social media, wikis and blogs. One third of the students also rated their knowledge fairly well on social networks, LinkedIn, E-portfolio and virtual worlds. Only one third of the students felt that they possessed good knowledge on information security issues and maintaining identity in social networks enough to apply for their personal benefit. Very few students rated their knowledge to the highest scale of 5 on social media and social media tools.

Measurable improvement in the awareness and knowledge of students on social media, social media tools, content generation and Creative Commons licensing was observed after their participation in the course. The increased rating on the awareness and knowledge of students on various aspects social media is illustrated below.

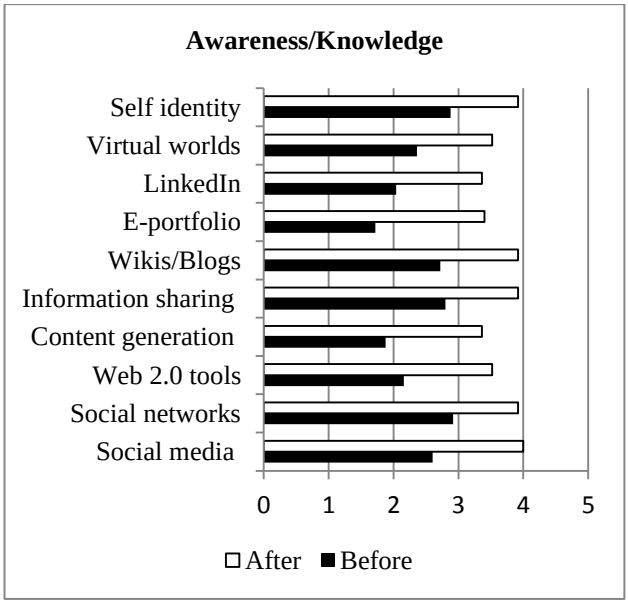

Figure 1: Awareness on social media and social media tools

More than 50% of the students increased their knowledge to the scale of 4 which meant that they felt confident to use the advanced features in social media communication technologies very well and would be able to advise others on the same issues as well. Progress to the

professional and creative knowledge level of 5 points was seen in 20% of the students in aspects of social media, information security, content generation and Creative Commons, LinkedIn and wikis and blogs. Insignificant number of students rated their knowledge in the basic level of 2 points, on web 2.0 tools (4), content generation (4), virtual worlds (3), e-portfolio (2) and wikis and blogs (1). Significant percentage of students (30%-48%) showed an improvement of their level of knowledge to level 3 in most of the aspects of the course content after the course completion.

3.3 Skills in using the tools

Significant increase in the level of skill was seen among students in using all the social media tools recommended for the-learning tasks. The difference in the level of skills in both using the tools and creating different presentations are illustrated below.

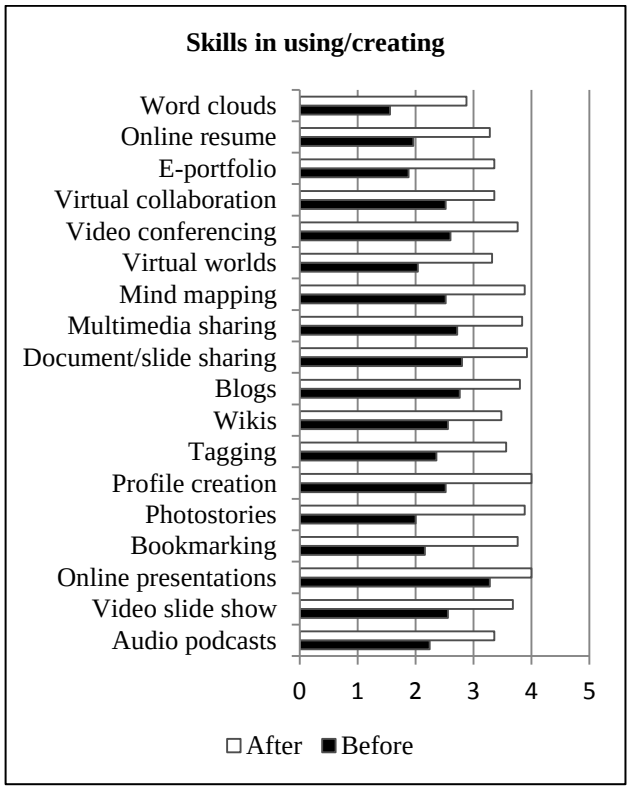

Figure 2: Skills in using the social media tools

The most significant improvement in the skills from the level of knowing the basic features of tools to the level of using the advanced features and as well offering advice to others was observed in using the tools for creating word clouds, online resumes, e-portfolios, photo stories and bookmarking and also in understanding the virtual worlds, particularly 'Second Life'.

Skills in using the tools for video conferencing, mind mapping, multi- media sharing, document and slide sharing, blogging, profile creating, photo stories, book marking and virtual presentations improved to the scale of 4 in more than one third of the students. Progress to the professional level of using and training was observed in one fifth of the students in the same set of tools.

3.4 Tools used for implementation

The three tools used for the course implementation namely the Optima (Learning Management System), Adobe Connect (Web conferencing tool) and Facebook (social network) had mixed impact on the e-learning. The students expressed both positive and negative responses to the effectiveness of these three tools for collaborative, virtual learning. The points of significance noted are,

3.4.1 Optima

The positive features for collaborative-learning observed were sharing, peer reviewing, peer discussions, accessing learning materials, audio recording and uploading multi-media files and links. However, the students found that the lack of personalized settings in folders, lack of search functions to find information and difficult shared writing functions as the demotivating factors to use Optima. They did not find using e-diaries interesting as they were open to all the students and had a plain, non-personal interface.

3.4.2 Adobe Connect

Adobe Connect was perceived as a new and interesting tool for the online lectures. Most of the respondents, except one student, felt that Adobe Connect provided the true ambience of a virtual class, with its desktop sharing, voting and chatting functions. This tool was highly appreciated, particularly by the students who attended the online sessions from different parts of the world (Europe, Russia and Africa) during their summer travels. The meeting recording features also benefitted the students for follow ups, when they missed the sessions. Students felt that the intermittent audio problems and confusing screen sharing features made the interactions impractical, when they tried to host their own presentations. Familiarizing the students with the hosting functions was time consuming and made it impossible to hold long interactive sessions.

3.4.3 Facebook

Facebook was best used for rapid spread of information and quick updates by the teacher. It also proved to be a good tool for getting immediate responses for decision making and short surveys. The students felt it was easy to keep in touch with the teacher and with the others participating in the same course. The students used Facebook mostly for asking the teacher questions and getting answers. This tool made it easier for the teacher to develop a personal trust and connection with the students as they felt it was easy to share their qualitative feedback with her through the Facebook messages and chats. Facebook's negative characteristics were considered to be the spamming games and commercials. Students gave

feedback that the Facebook group creation by itself did not generate in-depth interactions among the students Security issues and uncertainty of the messages reaching the teacher on time were also considered as the problems of communicating in Facebook.

3.5 Best practices in the course

The best practices in this course, as pointed out by the students were,

- Variety of new tools presented along with well-planned learning tasks
- Adobe Connect online sessions and availability of recorded sessions after lectures
- Facebook communication with the teacher
- Optima's sharing features
- Useful and interesting course content
- Flexibility, convenience and open grading system
- Knowledge on mind mapping, bookmarking, video making, online resumes and virtual worlds was highly beneficial

3.6 Worst practices in the course

Some of the worst practices listed down by the students were,

- To many tools and time consuming learning tasks
- Registration for tools and too many passwords to remember
- Lack of mandatory group assignments
- Lack of social interaction among students
- Lack of a motivating grading system
- Absence of compulsory online participation

4. CONCLUSIONS AND RECOMMENDATIONS

The feedback from the students and the findings from the survey on awareness and skills lead the authors to conclude that the online course positively and significantly improved the social media communication skills of the students. Overall, the implementation of the course was a success. Other points of interest observed by the authors are,

- the level of social media communication skills of students of higher education vary with individuals
- more and more curriculum based developments on the communication skills need to be implemented in higher educational institutions
- the knowledge of the students on conduct and behavior in social networks, information security and licensing on content generation and sharing lacks in-depth understanding, despite the fact that they are active users of social networks
- though the students are very active in their personal communication in Facebook, they are unsure and hesitant to interact with new members when it comes to communication and networking for education. This observation correlates with Murray (2008), as he indicated that the Digital Natives use OSN (Online Social Networks, Hamid, 2009) mostly outside of classroom context and for non-educational purposes. A study on undergraduate and graduate students by Kirschner & Karpinski (2010), showed Facebook users reported having lower GPA's and spend fewer hours per week studying than nonusers. However, they reported more extracurricular involvement, which could have been aided by their friends in their social networks. It would be interesting to explore the academic and extracurricular performance of students using social media further
- more guidance and instructions are needed to be offered to the students in order to initiate social interactions among new groups through social media

Based on their learning points from conducting the online course, the authors would like to make the following recommendations for others attempting to implement similar online courses with the objective of developing the social media communication skills of students in higher educational institutions.

- pre assessment of the e-learning skills and basic IT skills of students would help plan the type of tools and learning tasks to be included in the curriculum
- design of learning tasks need to include compulsory, collaborative group work online using social networks
- Project-based assignments that will allow students to discuss, share, explore social media strategies of organizations will be a plus point in virtual courses
- lot more peer support and guidance for students is necessary for successful implementation
- challenging grading system, strict deadlines and mandatory online presentations serve as motivating factors for quality learning
- design and implementation of virtual courses with social media content suitable for professional and business development of students and student entrepreneurs are desperately required
- e-portfolio development, participation in social networks for professionals, use of blogs as personal e-portfolios, Twitter for education, the use of Creative Commons licensing and the use of privacy features in social networks could be emphasized in the content of any course on social media in higher educational institutions

To quote Bonzo & Parzoma (2010), 'social media are more than the technology behind the social applications and programs. Their use includes a set of ideas about transformation and social gathering, mass participation, user-generated content, openness, flexibility, collaboration, community, and they are user-centered. If higher educational institutions can understand and adapt some of their practices to these principles, perhaps there is a chance for significant change in how tutors teach and how students learn'. The authors hope that they have succeeded to a considerable extent in creating awareness on social media among students by applying some of the core concepts of social media in their teaching to the personal and professional benefits of students. Furthermore the authors would like to recommend that all the higher education institutions must have social media guidelines of their own and they should take care that every student is aware of these guidelines in order to maintain a good professional identity in their social media communication.

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Psychosocial Factors in the Success of Electronic Learning Groups

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ABSTRACT

Online discussion groups in higher education potentially foster interaction and collaboration, both crucial for effectively engaging off-campus students and minimising student disengagement. With the creation of electronic learning groups, whose members work together online for mutual benefit, the lecturer/tutor becomes a facilitator rather than a source of knowledge. Exactly how to create and drive these learning groups and maintain a vibrant, useful discussion page is not always clear, and our experience has revealed that only a minority of students do engage actively online. The authors, with lecturing and language and learning advising experience respectively, examine students' perceptions of electronic learning groups and identify the barriers and facilitators involved in successful participation. In particular, analysis of relevant responses from the evaluation of online teaching in one university nursing course demonstrates the importance of psychosocial support in overcoming barriers to students' study engagement and success.

Key words: Nurse education; Online learning groups; Student engagement; Psychosocial factors

1. INTRODUCTION

The delivery of on- and off-campus courses typically involves traditional university learning and teaching formats, such as lectures, tutorials, and workshops/practicals. For external students, lectures are podcasted for convenient access and tutorials replaced by electronic learning groups (also called discussion boards/pages and forums). For practicals, face-to-face teaching is often needed; this is provided through intensive on-campus workshops. In e-learning groups students and tutor interact and collaborate to construct knowledge through the relationships developed. Flexible learning options are offered through a variety of online platforms and, more importantly, present students with the opportunity to fit the course into their own work situations [1]. E-learning groups are a means of encouraging and supporting students, monitoring their academic progress, helping them to develop their own area of "expertise", enabling them to manage their study, keeping them focused, and affirming their achievements. The technology allows academics to engage students and keep them engaged, even without face-to-face teaching. This is particularly relevant for off-campus students who may feel isolated and disengaged; e-learning groups have been mechanisms used to address these perceptions.

The objectives of this paper are: to discuss the facilitators and barriers to successful electronic learning groups; and to identify the benefits that successful engagement with electronic discussion groups brings to students and staff.

After considering applications of e-learning, particularly in higher education, and describing the university course involved (Health of Adults), we describe the formation and maintenance of the e-learning groups, thematise the comments arising from student evaluations of teaching, and analyse the positive and negative aspects, including the factors that facilitate successful e-learning group communication and functioning, and the barriers that arise. Possible improvements for future students are considered, thereby providing potentially useful lessons for others.

2. BACKGROUND

E-learning in higher education

E-learning has been used in various fields, incorporating both synchronous and asynchronous electronic communications. Various examples have relevance for health professionals [2-5]. In higher education, an increasing uptake of online courses has been observed, facilitated by the exponential increase in global Internet access. In Australia, of the 1.135 million students enrolled in all higher education courses in 2009, 12.3% (139,188) were external students (an increase of 5.2% over the 2008 total) and a further 6.3% (71,086) were multimodal [6]. According to the New Media Consortium's Horizon Report, "The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators in sense-making, coaching, and credentialing" [7]. Both within the higher education environment and outside, Johnson et al. [7] identify increasing expectations and needs to work collaboratively in and from a wide variety of contexts. Electronic discussion boards have been shown to supplement face-to-face teaching and foster further learning beyond the classroom [8].

While tutor and students in an e-learning group could be regarded as a "learning community", with "shared interest, commitment and competence", it is important, as Stevens [9] cautions, not to take these things for granted; the imperative is to aim for equity. Stevens [9] also highlights the tension arising from constraints on time and space for personal interaction and for reflection, "given the intrusiveness of the digital media and communication environment". Today's undergraduates, if they have come recently from high school, tend to be literate in information and communication technologies (ICT), having already used a range of ICT; however, improvements in the performance of students from lower socioeconomic groups, Indigenous heritage and rural students have been shown by Ainley [10] to be at a lower rate than the average for their year cohort. Moreover, it cannot be assumed that mature-aged students have the same ICT competency as school-leavers.

Course description: Health of Adults

The nursing course Health of Adults has a 9-unit value (assuming a 20 hours per week workload) and is offered internally and externally to second-year students. The course aims "to provide students with the knowledge and frameworks that will inform professional nursing practices in promoting, detecting, assessing, implementing and evaluating health care and major illness issues for adult men and women" [11]. By the end of the course, students should be able to: "Apply strategies to conceptualise problems and formulate a range of solutions in promoting and maintaining the health of adults" [12].

External students, from various geographic locations, take this course through: online delivery over 13 weeks using the University's online learning resources including lecture podcasts, assigned readings, participation in the e-learning groups, off-campus study guide, and attendance at a three-day compulsory workshop. They have access to a range of University learning services and online study workshops, and to online technical and administrative assistance. Students have the opportunity to evaluate the course and lecturer/tutor via online course and teacher evaluation questionnaires at the end of the study period.

All students were allocated to an e-learning group; though participation was not compulsory, it was highly recommended. The discussion board was designed as a learning resource, a means of disseminating information, sharing knowledge and experiences, and providing feedback. Students' contributions were not evaluated, but received feedback from the facilitator and other students.

One lecturer's approach to e-learning groups in Health of Adults

E-learning groups (for two groups of about 25 students) were conducted as follows: at the start of the study period (semester), the lecturer/tutor welcomed the group, and invited students to participate in the discussions, beginning with the health priorities that nurses should be addressing. In subsequent exchanges information about assessments and necessary preparations for the workshop were provided. The topics for each week were discussed, guided by questions. The tutor provided guidance concerning further sources of help and information. Throughout the study period, students were encouraged to relate their relevant work experiences, and to bring their questions to the discussion. The tutor created decision scenarios and linked these to real-life events, developing the students' critical thinking skills. Topical issues were discussed, as the tutor sought to find common interests. The tutor intentionally addressed each student individually, and continually monitored the participation level. A personal, inclusive, conversational approach was the norm. Group maintenance was fostered by affirming and encouraging the group members, convincing them that they could master the work involved. Humour played an important part in achieving a warm, collegial atmosphere. The tutor provided feedback on individual contributions and progress, and also kept up with other lecturers' postings. Online pre-examination revision sessions were included.

The approach was based on principles for teaching active learning classes in higher education (as outlined in the University of South Australia's guide [13], drawing on Ramsden, 2003). These six principles are: interest and explanation; concern and respect for students and student learning; appropriate assessment and feedback; clear goals and intellectual challenge; independence, control and engagement; and learning from students. problem-based learning [14, 15] was applied to the case scenarios in the e-learning groups.

3. METHOD

Observation and analysis of the e-learning group discussions identified the nature of the elements of the conversations, whether pedagogical, social, organisational, or technical, similarly to the categories used by Goold, Coldwell, and Craig [16] in their discussion of the roles of e-tutors.

Effectiveness was evaluated by analysing responses from the Student Evaluation of Teaching (SET) for emerging themes relating to the e-learning groups. (This was the only SET evaluation that students completed for Health of Adults; so these responses reflect closely the students' experience of the e-learning group facilitated by this lecturer/tutor, as this was her main contact with these external students, apart from at a three-day workshop, and also by e-mail and telephone.

The three open-ended questions in the course SETs were examined for comments on the lecturer's approach to teaching through the e-learning groups – best aspects, ways to improve, and any additional comments deemed relevant. The other ten items called for Likert scale responses to statements relating to teaching approaches and performance (Table 1). The recurring themes drawn from analysis of the students' responses in this study constituted the experience of engaging in the electronic learning groups.

In addition, the lecturer critically reflected on the e-learning group processes and outcomes, with a view to implementing future improvement; critical reflection involves examining one's assumptions, values and beliefs and looking at circumstances through a fresh lens in an attempt to gain new insights [17, 18]. Informal anecdotal reports from other tutors running parallel groups in the same course were also a source of data.

4. FINDINGS

The main components of the e-learning group conversations are described first. Under the pedagogical category, various approaches were used to teach the course content, including case studies, scenarios, problem-solving, question and answer, in order to clarify, affirm and encourage the students to reflect critically on the subject matter, and acquire relevant nursing skills. The social category encompassed group maintenance strategies, providing constant encouragement, and building students' self-esteem and self-belief. The organisational aspect involved ensuring that students were familiar with all the course requirements, and clarifying ways of contacting the tutor and other University personnel/services. Technical matters included providing information on how to access online resources, such as links to podcasts and other resource materials (e.g. medicine calculations, online quiz, and further readings).

As Table 1 demonstrates, there was very little disagreement with any of the statements about the tutor's role in this course, with an overwhelming majority indicating overall satisfaction.

Further detail is provided in the responses to the open-ended questions.

Table 1: Responses to the SET 10 core questions

Core questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The staff member made aims and objectives clear from the outset	0	3	0	17	15
… made the subject matter interesting	0	1	2	14	18
… motivated me to do my best work	1	0	4	7	23
… provided adequate opportunities for me to pursue my own learning	1	0	5	15	14
… helped me to develop my understanding of concepts and principles	1	0	4	16	14
… displayed a genuine interest in my learning needs and progress	1	0	4	9	21
… gave me helpful feedback on how I was going	0	2	4	13	16
… used up-to-date teaching and learning approaches	0	1	3	17	14
… made it clear how her/his teaching developed the qualities of a [University X] graduate	1	0	4	17	13
Overall, I was satisfied with the performance of this staff member [one nil response]	1	0	3	11	19

Themes that emerged from the SET optional text responses were: engagement with the tutor in an enjoyable learning experience; and becoming deep, independent learners. These are drawn from 21 relevant responses of the 23 to the question about the best aspects of the tutor's teaching (2 related to the workshop) and 11 relevant responses (out of 14) to "Any other comments?"

For ease of reading in what follows, minor corrections have been made to students' quoted comments (e.g. capitalisation, spelling).

Engaging the students in an enjoyable learning environment

The tutor kept the students engaged with their learning, and with the group, the study materials, and the course in general, by being "approachable", "very understanding", and "wonderful to communicate with", and conveying to the students, through her prompt responses and the time that she made available, that she cared about them, their learning needs and study success. This was conveyed through "email comments and advice" as well as via the discussion board, and her "encouragement throughout this course". Comments included: "She was friendly, positive and showed a great deal of enthusiasm in what she was teaching as well as in the success of me as her student", and "She genuinely wanted to see us learn and succeed, and she gave great constructive feedback to help us do so."

The tutor sought to put the students at their ease. Rather than being a daunting experience, e-learning became a pleasant, interesting one in which they experienced a sense of achievement: she asked questions to challenge them, but "didn't leave you to rot if you were having difficulties answering her questions" and the "good study assistance during swot vac [pre-examination week]" was appreciated. Other comments include: "She provided me with clear understanding of where I am able to improve and also aspects of my studies that I did well", and [the tutor] upheld a standard of expectations, which allowed me to structure my learning appropriately and kept me on track".

Hence, this facilitative role was an integral part of the success of the group. The supportive nature of the discussions, with "clear and easy to understand" teaching, and "a sense of humour", led students to feel accepted, free to ask questions, and able to achieve.

One student expressed frustration with the e-learning context:

> I find the use of bulletin boards to be a difficult tool to use and to learn with. It takes a lot of time and effort to use, participate in discussions with sometimes very little return …. There is not much discussion between people and not much incentive to do so.

Few respondents identified areas in which the tutor could improve her teaching; one would have liked "a little more on what was expected from essay", another "more communication with the students and … a lot of exam questions to practise", and another observed, "Not all my questions were answered as I would have expected". Two other responses did not refer to the e-learning groups. Some (5) did not suggest improvements, but indicated their complete satisfaction, for example, "I feel she does the best job now." Further comments included expressions of gratitude for the tutor's help, and pride in the confidence and knowledge gained:

> I have thoroughly enjoyed this subject. It has improved both my knowledge and skills, and even though being a mature age student, knowing I will have a shortened career in this profession, I feel confident in providing quality care to my clients/patients/residents.

In summary, despite some difficulties with the unfamiliar technology, most students found that the electronic discussion groups made a positive contribution to their undergraduate learning.

Becoming deep, independent learners

The tutor sought to extend the students' learning beyond the basic course requirements, through her questioning techniques, her "enthusiastic approach to teaching" and the topics encountered, and "her passion for the nursing profession". She was a guide and resource person for them in their learning journey, imparting her own motivation to the students, resulting in their "wanting to know more". She "pushed" one respondent "to critically think about all tasks including written assessments and nursing skills, and encouraged independent thought, seeking of current and relevant information, to answer one's own questions." Another was "excited about extending [her] knowledge and skills, and to continue to improve." Hence the electronic discussion contributed to developing lifelong learning habits and goals in the students.

5. DISCUSSION

Facilitators of successful e-learning groups

The first theme arising from the students' comments indicates the factors that facilitate successful e-learning groups: fostering student engagement and developing an enjoyable learning environment.

Fostering student engagement

Although student-centred learning is the aim, the teacher still has a role in achieving this. Effective communication skills, developed over many years, were an essential part of the tutor's ability to engage the members of the e-learning group. In addition to depth of knowledge, good, clear, prompt communication is a fundamental part of good teaching practice. Students were assisted to understand the feedback provided to them. Interpersonal skills fostered group cohesion and maintenance. Teacher effectiveness has been identified, in a school context, as being the greatest single school-based factor in academic performance [19]; this factor cannot be ignored in higher education settings. The approach of the tutor (instructor) has been found to be one of the factors affecting business students' level of engagement with their studies [20]. The e-learning group was transformed by careful planning into a community of learners, where all members focused on becoming competent to nurse adult patients.

Developing an enjoyable learning environment

The discussion pages revealed that by being approachable, enthusiastic about the course and teaching, passionate, showing a sense of humour, and genuinely interested and caring about students' well-being, progress and learning, the tutor conveyed a sense of presence. That is, the tutor was someone who was real and very much present, even though not in a face-to-face situation, and the students felt that they were not isolated from the other members of the group.

This sense of presence has been shown to enhance online learning relationships, as students come to feel "that they are present at a location remote from their own immediate environment" [21] and interact with others in the online environment. Moreover, the environment was collaborative, bringing the students closer together and being "visible" to each other. What Vinagre [22] has called "positive politeness strategies" used by the participants in the e-learning groups (for example, helping each other with minor queries about course requirements) contributed to a positive social context and learning environment.

The tutor played a significant role in creating this enjoyable learning environment through being encouraging and positive, generous with her time (checking the discussion board regularly, responding to e-mail messages), helpful, easy to talk to, and inspiring the students. Warmth and empathy were qualities identified by Goodwin [23] as contributing to student achievement, admittedly with younger students, but still relevant in higher education.

Barriers to the success of e-learning groups

It is important to promote the value of e-learning early in undergraduate education and regularly thereafter, so that students participate actively. A lack of understanding of the potential uses of asynchronous electronic discussions can deter or limit their uptake by university staff and students. Students' differing levels of technological literacy may present barriers to their initial participation. Time constraints can also hinder full participation for both student and tutor. The fact that postings can be read by other students enrolled in the course, not only those in their own group, means that students who are not skilful writers may feel diffident at first, knowing that others may scrutinise their contributions. Also, as shown by one student's negative comments, unfamiliarity with this technology raises a barrier for some. Technical problems included difficulties in navigating around the site, finding information, and inexperience with this learning context.

Psychosocial and technical aspects of e-learning groups

Of the three domains of learning (cognitive, psychomotor and affective), the affective domain, which encompasses the emotions, feelings, attitudes and values, has often received too little attention, and yet it has great importance for learning [24]. A study environment in which the whole person – body, mind and spirit – is acknowledged, and where the student is central, is conducive to effective learning. This is particularly important for students who as nurses will be engaged in the holistic care of their patients. Holistic care integrates all human dimensions including physical, mental, psychological, social, sociological, cultural, developmental, emotional and spiritual and these should also be considered in higher education.

As is evident from the above, the single most important factor in the success of the e-learning groups was the leadership of the tutor, creating "a hospitable space for learning" [25]. The tutor's presence and dedicated contribution of time fostered optimal collaborative learning. Even when she felt that she was talking to herself at times when students were not contributing to the discussion, she persisted in engaging with the silent students ("lurkers") and drawing them into the discussion. The tutor's interaction was essential to building students' confidence in using the discussion board and their belief in themselves and their own abilities to succeed in the course and as nurses. As relationships were built up, the students felt more comfortable to participate and so achieve the desired learning outcomes [26].

Some technical hurdles lessened a few students' engagement with this electronic learning environment. Despite its flexibility, suitability, and functionality, which met the needs of most participants, for others the human touch – the body language, tone of voice, etc. that are part of face-to-face communication – was missing. For the more "tech savvy" students, the lure of potential distractions while online (such as social media) may have affected their participation.

In 1998, Professor Fay Gale stressed the need for universities to recognise "the demand for human skills", even greater in "virtual campus" situations [27]. Earlier still, Naisbitt [28] demonstrated that "whenever new technology is introduced into society, there must be a counterbalancing human response – that is, high touch – or the technology is rejected. The more high tech, the more high touch." (See also our 2008 paper [29].)

Benefits of successful engagement with electronic discussion groups

When electronic discussion groups work well, there are benefits for students, staff and, by extension, the learning and teaching context.

Students

E-learning groups provided a place of growth for off-campus nursing students, and, as shown above, guided their development as deep, independent learners. To begin with, they were provided with knowledge and instruction, shown where to find the latest correct information, given direction in finding further information for themselves, and their thinking and practice were challenged – in areas of decision making, care planning, competencies, and improving patients' health outcomes. They were up-skilled, not only in nursing, but also in computer technology and use, which would play an important role in their future nursing careers.

The e-learning group provided feedback, helping them to understand where they could improve and affirming their progress. This helped sustain their motivation to continue their studies and do well. This course targeted all but one (international perspectives) of the qualities that our graduates should possess, the others being acquisition of a body of knowledge, lifelong learning preparation, problem solving skills, ability to work both autonomously and collaboratively, ethical action and social responsibility, and effective communication [12]. The e-learning group was instrumental in contributing to developing these qualities to varying degrees. For example, on the topic of pain control, problem solving and collaborating with other health professionals were part of finding creative ways of pain management, including non-pharmacological approaches.

Staff

As revealed by self-reflection and informal discussion, staff members received many benefits from being involved in the e-learning groups. First was the satisfaction that came from knowing that students were engaged in their learning and achieving competencies in their field. Lecturers' experience with diverse teaching methodologies was expanded and enriched as they learned to change from being seen as sources of knowledge to being seen as e-tutors facilitating learning, and even coaching and encouraging students to do their best, find answers for themselves, assess information critically, be creative and think laterally. Tutors learned from each other, as they shared resources and observed others' lively discussion groups. Students' recognition of the tutor's contribution to their successful learning was shown not only by the SET results, but also by the many informal expressions of thanks.

As university staff become more familiar with these new learning and teaching contexts, they are open to seeing the possibilities for extending their use, and ways in which technical improvements can aid ease of navigation, particularly for new students. Later innovations can be incorporated to enrich the electronic platform, and the learning environment.

Continuous improvement and future directions

Modifications have been implemented in subsequent online nursing courses to improve the students' experience. These include: clarifying course objectives and outcomes, tutor's role and expectations of all involved (respecting and listening to each other, readiness to participate, "netiquette" and no "put downs"); agreeing on group norms; giving more advice concerning how often to check e-learning group postings, and the times that the tutor will be checking the postings or e-mail each day. Each topic is outlined at the beginning of the week, and at the end of the week review questions are used to recapitulate the highlights. Good quality questions posed by the tutor sustain the online conversation. All students' questions must be welcomed, and none trivialised. In addition, early activities for getting to know each other help the group to "get off the ground".

Appropriate professional development and mentoring from those more experienced is important for new e-tutors [16]. While the University has a store of online teaching and learning guidelines [30], a useful addition for staff would be discipline-specific good practice guides.

In future, an aspect of e-learning groups that needs addressing is low participation, as some students preferred to be silent listeners/viewers or to avoid taking part at all. In considering how to increase active participation, factors identified by a practitioner at another level of education; a Victorian senior secondary school teacher has described the advantages of using electronic discussion for his English class, and also the areas in which participation could be improved – through explicit teaching of skills (posting and replying), and showing the relevance and advantage of the students' participation [31]. Moreover, apportioning marks for online contributions is another way of ensuring wider participation. As mentioned earlier, meaningful learning relationships are conducive to greater participation in online learning [26].

Additional technology can be incorporated into the basic discussion board platform to increase its interactivity. For example, the use of Skype, Voice over Internet Protocol (VOIP), and "second-life" virtual reality (for example, student nurses directing an "avatar" to complete tasks in an online scenario) could enhance the online learning environment. It is important to realise, however, that technology is simply providing the structure; rather than letting students move around without direction, a good e-tutor is a must. The *Horizon Report* [7] envisages a wide range of emerging technologies that will play an increasingly greater role in higher education over the next few years, including mobile phones, augmented reality, and game-based learning. Educators need to be aware of the technologies that their students will be using outside of their studies, and have the flexibility to incorporate these where appropriate. At the same time, the whole of the student's experience must be kept in mind, rather than focusing excessively on one particular innovation [32].

6. CONCLUSION

The outcome of a well-maintained and structured electronic group is the formation of a learning community, building bridges and linking the participants in a fully engaged group. A limitation of this study is that it is based on the perceptions of one tutor's students in one course. Nevertheless, its findings provide pointers for other situations in which e-learning groups are used. An instrument designed specifically to evaluate e-learning groups and their engagement would be appropriate. Other suggested improvements and plans for future implementation have been considered here.

This paper has highlighted the central role of the tutor/lecturer in creating and maintaining such a group in a higher education learning and teaching context. The tutor provides the essential human touch, which has long been recognised as integral to the optimal use of technological innovations. The most significant

achievement of the e-learning group described was its ability to facilitate human interaction and provide psychosocial support to students as they grappled with new knowledge and skills. In the process of fostering a learning environment in which the human touch is never forgotten, the skilled facilitator is also rewarded by the e-learning group relationships that develop.

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Development of new e-Learning contents for improvement of laboratory courses by using the AR technology

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ABSTRACT

In the engineering education field, laboratory courses are very important practical lessons for confirming theories studied. For these courses, we have developed new e-Learning environment that is consisted the personal booth and Web-based instruction manuals [1]. The Web-based instruction manual is containing rich illustration to describe about experiments work. Moreover, we developed new e-Learning contents for learners by using the AR (Augmented Reality) technology that can instruct to actual equipment [2-4]. We think student will more easily understand how to operate experiment equipment by watching real things rather than watching them illustrated contents.

We are sure that our contents are useful for improvement of these courses. Moreover, we conducted the evaluation experiment to six students who are fourth grade students in department of electrical engineering with a history of this course. After they use our content, we asked six questions about use of our contents. In this experiment, we confirm our contents are helpful to learn how to operate experiment equipment than past-illustrated contents for student who has vague understanding about operation of equipment.

In this paper, we report our content and results of the evaluation experiment.

Key words: e-Learning contents, augmented reality, electronics laboratory courses, engineering education, evaluation experiment, contents creation support

1. INTRODUCTION

In the Engineering education field, laboratory courses are very important practical lessons for confirming the theory studied. Students are improving their skills gradually from a rudimentary stage within a very limited classroom time in these courses.

Our universities too, these courses are conducted as electronic engineering experiment and programming exercise. However, these has been placed in a tough condition that there are only a few teachers for more than one hundred students. In this situation, it is hard that teachers support for working of all students. Therefore, experiment manual for such courses plays a key role to guide students properly. Experiment manual must be described appropriately about real work. In Tohoku Gakuin University, the experiment manual is consisted by illustrations as shown in Figure 1. This is contained rich illustrations for describe how to operate experiment equipment. These illustrations are described carefully about experiment work to lead students. By introduction of this manual, we obtained certain results. However, some of students still have inadequate understanding. Students are watching actual equipment. We think student will more easily understand how to operate experiment equipment by watching the actual equipment rather than watching them illustrated. We think that we must strive hard toward to describe experiment work faithfully.

2. The current experiment environment for laboratory courses

In the Tohoku Gakuin University, laboratory courses are conducted by using the personal laboratory booth and web-based instruction manual as shown in Figure 1.

The personal laboratory booth is installed some experiment equipment as shown in Figure 2, that an oscilloscope, power supply device, soldering iron, etc. Also, in addition to these devices are installed PC. Each student does experiment using the personal experiment booth individually. In addition, the Web based instruction manual for experiments progress is composition by Web page of describing for theories about experiment and describing for experiments work. Student does experiment with personal booth while watching a Web page of Web based instruction manual. Because of this, teacher can obtain the access log to each page

of each student. This is expected to help improve for next class by feedback to teachers.

Figure 1. An example of a web-based manual (in Japanese)

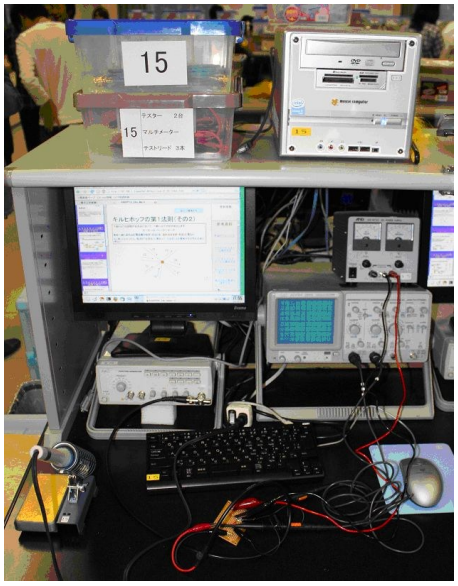

Figure 2. Overview of the personal laboratory booth

In the web-based instruction manual, description about how to operate experiment equipment is described by rich illustrations for instruct to student's experiment work. However, in the personal experiment booth, some students, there is a vague understanding of experiment equipment operation.

We think that students think understand by only watching the illustrated and go to next step, In fact, there are some of students who are confusing when operate actual equipment such as exercises part. To solve this issue, we have thought that they must operate experiment equipment tightly at each page not only watching the illustrated. Therefore, we have focused attention on the AR (Augmented Reality) technology

Therefore, we have developed new e-Learning content by using the AR technology that can superimpose instructions on actual equipment.

3. Prototype of new e-Learning content for laboratory courses by using the AR technology

The Augmented reality technology is a term for a live direct view of an actual-world environment that is augmented with virtual image generated by computer [5]. It can enhance one's current perception of reality.

By using it, we have developed the prototype of new e-Learning contents that can instruction to actual equipment without using indirect illustration. Because of this, we think student will operate experiment equipment and understands how to operate them tightly. In this addition, student will understand more easily than watch the illustrated content.

To build AR content, we are using the "FLARToolKit" [6] that is a programming library for creation of AR application by using ActionScript3. Because of this, our content can be used in existing manual page as Flash content.

Incidentally, our content requires a marker (simple black square) for recognize experiment equipment. Therefore, we installed the Web-cam to existing experiment environment. Incidentally, this is fixed by a flexible arm clip as shown in Figure 3. Content captures it, decides positions of superimpose instructions. For this reason, we installed the marker to experiment equipment. Content search the marker from captured image via Web-cam, and then superimpose the instruction images.

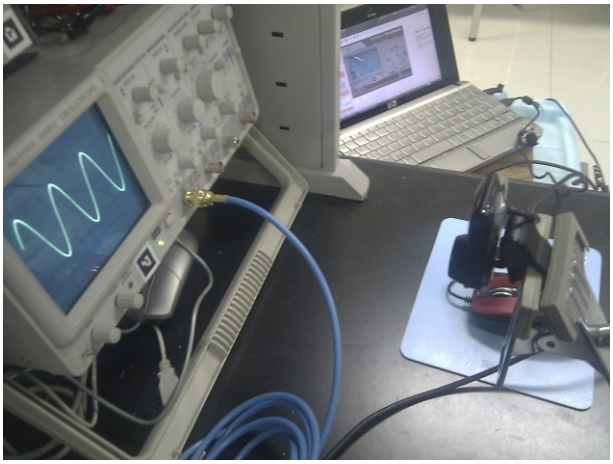

Figure 3. An example of fixing for Web-cam

3.1 Superimposition of instruction images

The new e-Learning content can directly instruct to actual equipment through the superimposed instruction images on the actual movie getting from the web-cam. Figure 4 is showing view of actual equipment. Figure 5 is showing an example of running the content. In this case, content must know a position of equipment in advance for superimpose the instruction images on the image of actual equipment. This position will be known by using the simple black square (marker) to equipment in advance. Actual superimposed position is decided by the position of marker on the equipment. Student can watch the instructions by shooting the marker using the web-cam.

Figure 4. View of an actual equipment

Figure 5. An example of running new e-Learning content.

3.2 Definition of instruction image

To use in real classes, teacher need to create new contents by oneself. However, our contents are written by over thousand steps ActionScript3. In such condition, it is difficult that teacher creates new content by oneself who does not have programming knowledge. To solve this issue, we think need to way to create content more easily. Therefore, we implemented function that content can be created by writing in XML. In generally, AR content requires some information of superimposed object such as path to object data, position to superimpose and object size in actual-world environment. In the contents has been developed so far, these information are written in program code. We changed to method to write such information in XML as shown in Figure 6. Because of this, teacher will be able to create new contents by only write some simple elements about information of superimposed objects without programming and compilation. In addition to above, we have a plan to develop authoring tool for more easily able to create content even unnecessary to write in XML. We think teacher can be able to create new contents easily than write in XML by using it. We think that AR contents will be useful to use in real classes by our some improvement. Incidentally, teacher can define the multimedia object such as sound and video, not only image. Because of this, teachers can customize the content with various media.

Figure 6 is showing an example of definition of video object. In this example, video object is defined in line 13 from line 1. Video object contains a video to support experiment work. If teacher define an instruction image with video data, student can playback it by click the superimposed image as shown in Figure 7 and Figure 8. In this addition to video object, teacher can define sound objects that can playback voice navigation as in line 26 from line14.

```
001 : <annotation type="video">
002 :     <icon>Annotation/10khz.png</icon>
003 :    <video>Annotation/button.flv</video>
004 :     <position>
005 :         <x>-15</x>
006 :         <y>-140</y>
007 :         <z>0</z>
008 :     </position>
009 :     <size>
010 :        <width>25</width>
011 :        <height>30</height>
012 :     </size>
013 : </annotation>
014 : <annotation type="sound">
015 :     <icon>Annotation/pp5v.png</icon>
016 :    <video>Annotation/navi.mp3</video>
017 :     <position>
018 :         <x>35</x>
019 :         <y>-160</y>
020 :         <z>0</z>
021 :     </position>
022 :     <size>
023 :        <width>25</width>
024 :        <height>30</height>
025 :     </size>
026 : </annotation>
```

Figure 6. An example of specification of instruction object

Figure 7. An example of superimposed image which is specified in Figure 6

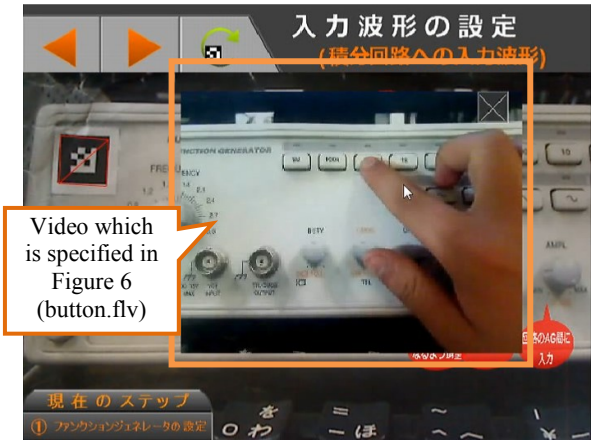

Figure 8. An example of playback the video that specified in Figure 5

4. Results of evaluation experiment

We should experiment for our contents to use in real classes. Therefore, we conducted the evaluation experiment to six students. Moreover, we asked six questions to students after uses our content. In this section, we report the answers of students in the evaluation experiment. Table 1 is showing the questions. Results of evaluation experiment are shown in Figure 9.

Table 1. The questions that we asked to student

Q1	Were you easy to manipulate the Content?
Q2	Do you think that operation of content is easy by you get familiar with it?
Q3	Were you easy to see the instruction by AR?
Q4	Do you think that our content is helpful to learn?
Q5	Do you think our content is easy to learn operation of equipment than illustrated?
Q6	Would you like to use our content from now on?

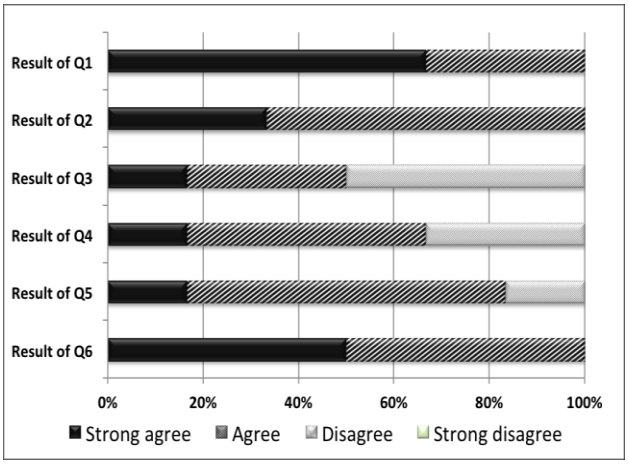

Figure 9. Answers of students in the evaluation experiment

in the question 1, 67% of the students answered "Yes, Very easy to manipulate the content".
Even including the question 2, most students answered agree. These results indicated that operation of content would not interfere with the learning. However, in the question 3, 50% of the students answered disagree. Therefore, teachers need to consider about superimposed objects design and way of fixing camera to stabilize the superimpose objects and instructions.
Moreover, in the question 4 and 5, many students answered agree. These results indicated that our contents are helpful for student who can't understand operation of equipment using illustrated contents. In finally question 6, all students answered agree. By these results, it is indicated that our content is useful for laboratory courses. We think that to use content more effectively in real classes, it is important that teacher should devise the content such as attach the video and build in more detail. Therefore as next step, we will develop an authoring tool for teacher will be able to create a new AR content freely.

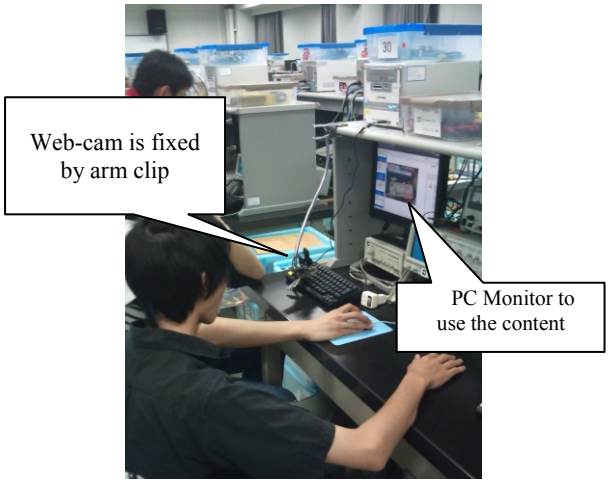

Figure 10. Students who are using our content

5. Conclusion

In this paper, we reported the prototype of new e-Learning content that can superimpose the instruction on actual equipment. In this addition, we obtained results that our content is useful to learning for operation of experiment equipment from evaluation experiment. To use in real classes, we think it become more useful through a customization for instruction by teacher.

As future step, we will work to development of authoring tools for improvement of content creation and improvement of visibility for instruction images.

Acknowledgement

KAKENHI Grant-in-Aid for Scientific Research (C) (23501172) supported this work.

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Standards for measuring the Netspeaks quantity in on-line text content

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ABSTRACT

Everyday use of new communication channels such as MSN, Skype, Facebook, and SMS is changing the written language in many ways creating the new language form called Netspeak.

In this paper the authors develop the methodology for measuring the frequency in using Netspeak elements through ten specific standards. The standards are named, described and grouped into four categories regarding the provenience of language phenomena found. The first group of standards is related to the information communication technology; the second group is related to the grammar and syntax; the third one is related to the prosody and the fourth one named other is related to every other kind of provenience. The standards are applied in analyzing the content of asynchronous discussions throughout four generations of students within the course Information and Communication Technologies at Zagreb School of Economics and Management. The study shows the correlation between the use of standards within each group and shows the more frequent use of Netspeak elements by more active students.

Keywords – Netspeak elements, standards, on-line text content, discussion, quality

1. INTRODUCTION

"At the time Albert Einstein discovered the theory of relativity he faced a new surprising thing. This world known physicist soon realized that his fascinating and revolutionary discovery that shook the basics of Newton classic physics impossible to be expressed and explained using the existing vocabulary because of the very simple reason: the terms describing the new phenomenon didn't exist. Following the development of communication technologies and the transformation of media from auditory and written to the graphical and interactive, opened up the need for a specific language with a vocabulary that enables description and convey all the changes and phenomena in the communications field of today", says Ivana Tarnaj [1].

The authors of the European Council study "The new space of communication, the interface with culture and artistic activities" divide communications into two categories - interactive and mass communication. Interactive communication is based on the concept of shared space. When we communicate we share the same physical space with someone and we create an interactive system with a person with whom we are communicating and by using a common communication method which is the same language.

As well as technology, the notion of communication has a very tight connection to the notion of culture. In his book "Communication as Culture: Essays on Media and Society", James Carey explains the notion of communication through two models. The first model he names transmission, and the second one communication as a ritual. Carey describes communication as a transfer of concepts such as sending, transmission, providing information to others, transportation, etc., stating that communication is transmission of the signals or messages in distance for the purpose of control. The model of communication as ritual on the contrary refers not to dissemination of messages through space, but to the maintenance of society or community through time where communications is represented as a common belief. The communication as a ritual is a kind of a social ritual in which participants feel connected to each other in a community. [2]

In a study dealing with literacy in the computer age, Myron Tuman considers associability and nonlinearity as an attack on "the status of texts as a higher and more logical phrase of symbolic knowledge". Digital literacy is particularly problematic in education, which now encourages students to "cruise the information highway seeking and embracing the minimum necessary information", confusing information with knowledge. [3]

Fluid and volatile electronic environment, associative, non-hierarchical and non-linear organization is considered to be a benefit of the digital environment by other theorists. Multilinearity and dispersion are characteristics of the human psyche, which is why the new media fail "to imitate"

the human mind. The development of cyber-space, claim the advocates of technology, is an illustration of non-hierarchy and nonlinearity of the human perception. [4]

As shown in Figure 1, the goal of every communication process is to analyze the source, coder, transmitter, channel, receiver, decoder, and recipient. The communication process is set so that the source products the information (I) which is encoded in message (M). The transmitter materializes the message in the signal (S). Signal is good if it has the same shape as the message, if it is aligned with the channel, which also has very specific material properties. The signal in the channel is affected by noise (N), which interferes with communication flow. Noise or interference should be considered besides any discrepancy between the parts of the communication chain. Mismatch between the encoder and decoder generate semantic noise. The receiver can inform the source of the feedback notification (F) which closes the communication process. [5]

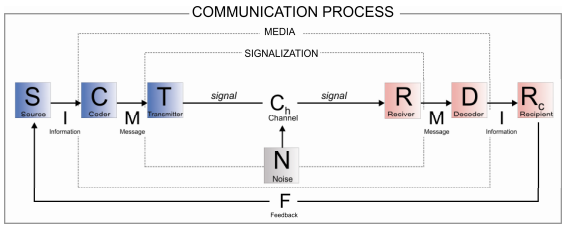

FIGURE 1
COMMUNICATION PROCESS

2. STANDARD DESCRIPTION

Croatian language is a Slavic language spoken by Croats in their communities. Any society that homogenizes, achieves it due to internal communication. For the purposes of this communication forms, a common language (koine) is created, which occurs spontaneously, appropriate to the needs and communications, space and/or time. It optimizes according to the principle of the minimum cost, the economy of the language, such as lingua franca. The standard idiom has a function of understanding and creating the official, general and cultural activities in schools, universities, parliament, national television and radio, print, public signs, services and activities of clerks and political, entrepreneurial, scientific and professional public. It is one and unique to all members of diverse organic idiom to whom is possible and desirable. [6]

In order to measure the quantity of Netspeak elements the authors created 10 standards grouped into 4 categories regarding their provenience. The first group is ICT and gathers 3 standards: words in English (I1), acronyms and abbreviations (I2), emoticons (I3). The second group is grammar and syntax and gathers also 3 standards: lower case graphemes (G1), diacritics (G2), space (G3). The third group is prosody and gathers 3 standards too: punctuation (P1), uppercase graphemes (P2), prolonged graphemes. The fourth group is „other" where the authors placed individual and sporadic elements such as the use of past tense „aorist", etc.

TABLE 1
STANDARDS FOR MEASURE THE QUALITY OF NETSPEAK ELEMENTS

STANDARD	DESCRIPTION	P
I1 – English words	New technologies development is based on English language so it happens that Croatian is subjected to overwhelming English words.	10
I2 – acronyms and abbreviations	Acronyms and abbreviations are composed of the initial letters of each member of the expression in them. Abbreviations are mixed; there are regular and occasional ones. There are common abbreviations that are short parts of words or sets of words, and read as if words are spelled correctly. Other abbreviations are formed by merging the initial letter or letters of multi-member group called names and is usually read as written.	10
I3 – emoticon	Emoticons are signs, symbols. They are not just colon and parentheses, it is a sign of a good or mood, and sometimes takes other meanings depending on the context in which it is used. Symbols are signs in which the relationship between signifiers are already learned.	10
G1 – lower case graphemes	Contrary to the grammar rules, the use of lower case graphemes where it should be used upper case graphemes.	10
G2 – diacritics special signs	Part of the grapheme that change the sound of the grapheme. Those signs are omitted and often recorded by the standard rules of English language.	10
G3 – space	The omission of space where needed, after punctuation.	10
P1 – punctuation	Punctuation is used in a non standard way in order to compensate the auditive channel within the discussion.	10
P2 –uppercase graphemes	In written Croatian language there is standard use of uppercase in three particular situations. First is with the proper names, the second as the first letter in a sentence and finally in order to express politeness. Though, there are some exceptions. Uppercase within the whole word, sentence or text can be used for esthetic, advertising or propaganda reasons. It is used in order to emphasize the specific word and to plan and to add the prosodic elements to the written word.	10
P3 –prolongation of the graphemes	In written Croatian language there are 30 sounds each represented by single grapheme (except three sounds being represented by double graphemes *dž, lj* and *nj*). There's no such a thing as geminate (a double consonant such as *mm* i.e. in word *communication*). It is used in order to add prosodic elements to written words. Prosody gives rhythm and melody to a word. It comprehends acoustic parameters such as accent, intonation, and melody.	10
O – Other	Use of tense considered to be obsolete – aorist. As far as the past tenses are concerned, the most frequent and the most dominant tense in contemporary Croatian is the Croatian *perfect - Vidjela sam te* (PERFECT – *to see*). Shortened form, *aorist* form would be *Vidjeh te.* (AORIST – *to see*).	10

3. MEASUREMENT OF THE QUANTITY OF NETSPEAK ELEMENTS WITHIN THE CLOSED DISCUSSION

The quantity determined under Netspeak ten standards will be measured at a very advanced closed discussion [7, 8] of the course Information and Communication Technologies [9] through 4 different generations. From 2008/2009 to 2011/2012, 421 students (39.64% of all students) have taken an active part in discussions. Analyzed sample is shown in Table 2.

TABLE 2
NUMBER OF STUDENTS WHO PARTICIPATED IN THE DISCUSSIONS

Academic year	∑ students participated in the discussion	∑ students on the course	%
2008/2009	134	295	45.42%
2009/2010	110	341	32.26%
2010/2011	103	244	42.21%
2011/20012	74	182	40.66%
∑	421	1062	39.64%

The most active generation of students is the one of the academic year 2008/09, when 45.42% of students actively participated in discussions as a supplementary activity within the course.

Table 3 shows the distribution of Netspeak elements grouped in ten standards through four generations of students analyzed within the same course.

TABLE 3
DISTRIBUTION OF NETSPEAK ELEMENTS IN TEN STANDARDS

	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	avg.
I1	92.62	83.65	94.53	96.84	95.50
I2	66.28	58.83	64.27	66.22	65.09
I3	26.80	32.33	28.14	36.16	31.49
G1	19.89	28.20	17.59	15.73	16.81
G2	20.96	19.82	13.09	16.90	14.69
G3	37.38	41.36	38.45	42.69	40.22
P1	52.79	55.90	35.05	31.05	33.38
P2	6.36	6.76	3.76	3.00	3.44
P3	5.67	8.82	0.92	3.36	1.94
O	0.00	0.00	0.00	0.17	0.07
∑ avg.use	32.88	33.57	29.58	31.21	30.26

Average use of Netspeak elements quantity is 30.26. Figure 2 shows the distribution of Netspeak elements by academic years. It is expected the new generations of students to be keener to the use of Netspeak but there are many other factors affecting the amount of used elements, such as student's activity or the quality of the discussion. [10, 11] In generation 08/09 as many as 45.42% of students have actively participated in discussion, but the generation of 09/10 had a very high quality discussion, so there are slight discrepancies regarding the mean values used in analyzes of Netspeak in the last four generations of students. Netspeak elements appear approximately equally often in all generations. Netspeak elements at least appear in the generation of 2010/2011, mostly in the generation of 2009/2010. But the difference is negligible and amounts only to 3.99.

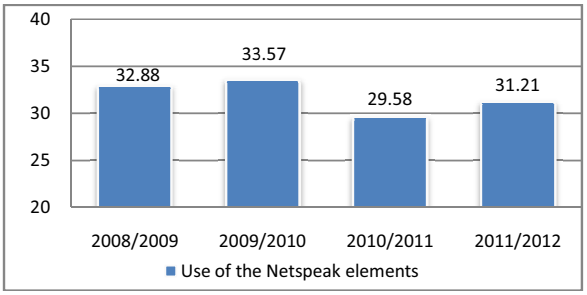

FIGURE 2
ARITHMETIC MEAN OF NETSPEAK ELEMENTS QUANTITY

To ensure that the arithmetic mean of the sample is representative and reliable indicator of the value of using Netspeak elements we have examined the standard deviation (Std. Dev) and the coefficient of variation (V) sample of students through the academic year. The results are shown in the Table 4.

TABLE 4
INDICATORS OF THE REPRESENTATIVE ARITHMETIC MEAN OF THE SAMPLE

	N	Mean	Std. Dev.	V
2008/2009	134	32.88	11.28	34.31%
2009/2010	110	33.57	14.19	42.27%
2010/2011	103	29.58	9.46	31.97%
2011/2012	74	31.21	11.16	35.76%

The results show that the coefficient of variation of the mean for all samples through academic year is less than 50%, which confirm that the arithmetic mean is representative enough.

Figure 3 shows the frequency of use of the each standard within the analyzed sample.

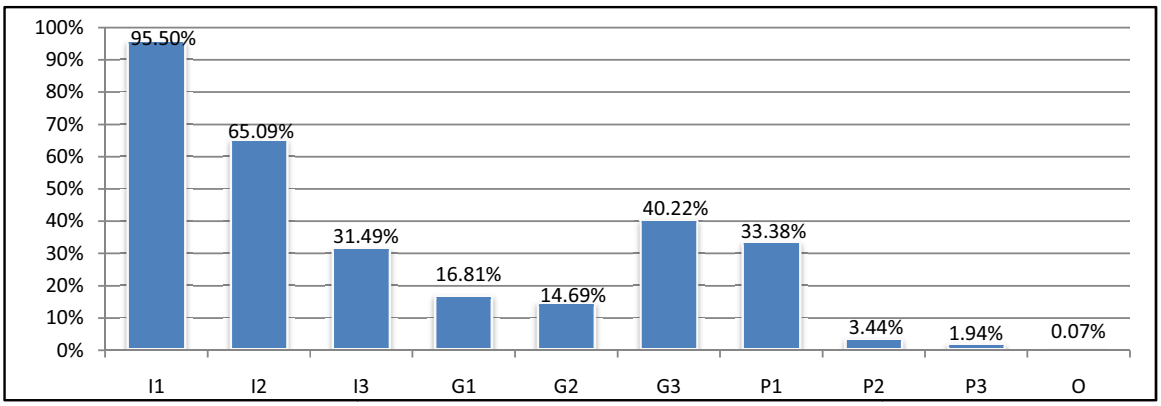

FIGURE 3
THE FREQUENCY OF USE OF THE EACH NETSPEAK STANDARD

As many as 95.50% of students use the standard I1 and that is words in English. Such a high percentage might be explained by the specificity of ICT course and the overwelhming use of English words for technical phenomena lacking the adeguate word in Croatian language. It can be assumed that within some other course this percentage might have been considerably lower. Also, 65.09% of students use standard linked to acronyms and abbreviations (I2). The standards G3, P1 and I3 in the second group according to frequency of their use. 40.22% of students ommit the diacritical marks (G3), while 33.38% of students use the punctuation in nonstandard way evoking some prosodyc effects for example, yelling, shouting, increasing or decreasing the intensity of the voice (P1), and 31.49% use emoticons (I3). 16.81% of students write the whole post using lower cases (G1), while 14.69% of students do not use space after the punctuation. Standards used below 5% are P2 concerning upper cases with 3.44%, standard P3 used 1.97% as well as the standard O considering the use of obsolete tense - aorist with just 0.07%.

Figure 4 shows the quantity of each standard within Netspeak elements used as a whole.

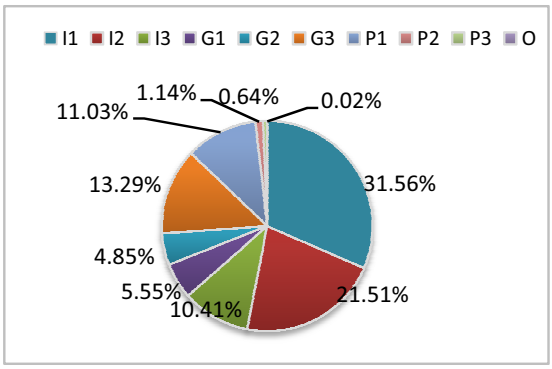

FIGURE 4
THE QUANTITY OF EACH STANDARDS OF NETSPEAK

31.56% refers to the standard I1, 21.51% refers to the standard I2, 13.29% to the standard G3, and 11.03% refers to the standard P1. Standard I3 is used 10.41%, G1 5.55%, G2 4.85%, P2 1.14%, P3 0.64%, while the standard O is used just 0.02%.

Figure 5 shows the distribution ratio by each group. Majority of the percentage, 63.47% goes to the group one, ICT; 23.7% belongs to the second group, Grammar; 12.81% is the percentage of standards belonging the third group, Prosody, and just 0.02% goes to others.

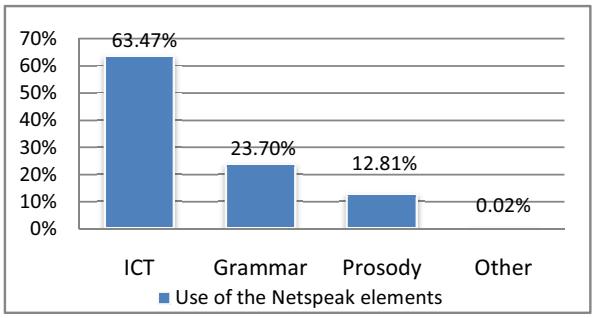

FIGURE 5
DISTRIBUTION OF STANDARDS WITHIN THE GROUPS

4. RESULTS ON STATISTICAL RESEARCH

The authors set the following hypothesis regarding the amount of Netspeak elements within the closed discussions:

1) There is a correlation between the uses of each Netspeak standards within the each group.
2) More active students or the students having the better quality discussions use more often the Netspeak elements then less active students.

4.1 Hypothesis 1 – Correlation between each standards within the group

Pearson correlation coefficient on the sample of 421 students shows how the use of elements are correlated as shown in the Table 5. Given statistics are the results obteined from „Paired simple t-test correlation" analysis.

TABLE 5
CORRELATION WITHIN THE EACH GROUP

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	I1 & I2	421	.290	.000**
Pair 2	I1 & I3	421	.095	.053
Pair 3	I2 & I3	421	.149	.002**
Pair 4	G1 & G2	421	-.040	.413
Pair 5	G1 & G3	421	.117	.017*
Pair 6	G2 & G3	421	.100	.040*
Pair 7	P1 & P2	421	.164	.001**
Pair 8	P1 & P3	421	.187	.000**
Pair 9	P2 & P3	421	.123	.012*

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (1-tailed).

Within the ICT group there is a correlation between the use of English words and the use of acronyms and abbreviations and emoticons. Also, there is a correlation between the use of acronyms and abbreviations and emoticons. It is evident that there are statistically significant correlations between standards: I1 and I2, the correlation is significant at the 0.01 level and its value is 0.290 which is a weaker correlation. Standard I2, correlate with standard I1 as well as with the standard I3. In the group of Grammar there is a very weak correlation between using lower cases and the omission of diacritical marks as well as the low correlation between writing without using space and the omission of diacritics. Standard G1 correlate very weakly with the standard G3, with statistical significance of 95%. In weak correlation of 0.1 are also G2 and G3. Within the Prosody group there is a correlation between all standards, though it is very weak. The correlation ratio goes from 0.123 between the standards P2 and P3 to 0.187 between the standards P1 and P3.

4.2 Hypothesis 2 – Quantity of Netspeak and the quality of the discussions

In order to obtain as reliable sample as possible the authors analyzed the quality of discussions of the students who have participated in at least five different discussions. Quality of the discussion is measured with the method content analysis [10, 11]. The sample represents 104 students which is 24.7% of the whole sample that participated in the discussions. Table 6 proves that the chosen sample is representative.

TABLE 6
INDICATOR OF THE REPRESENTATIV SAMPLE

	N	Mean	Std.dev.	V
Use of the Netspeak elements	104	31.49	9.99	31.73%

Arithmetic mean of the selected sample of students coincides with the arithmetic mean calculated using Netspeak elements obtained by analyzing the sample of 421 students across all academic years, and the coefficient of variation confirmed that the arithmetic mean is representative.

Table 7 shows the correlation between the use of Netspeak elements and the quality of the discussions on the selected sample.

TABLE 7
CORRELATION BETWEEN MORE ACTIVE STUDENTS IN DISCUSSIONS AND THOSE WHICH THE DISCUSSIONS ARE OF BETTER QUALITY AND THE USE OF NETSPEAK

Correlations			
		The use of Netspeak	Quality of the discussion
The use of Netspeak	Pearson Corr.	1	.276**
	Sig. (2-tailed)		.005
	N	104	104
Quality of the discussion	Pearson Corr.	.276**	1
	Sig. (2-tailed)	.005	
	N	104	104

**. Correlation is significant at the 0.01 level (2-tailed).

It is possible to see that there is a correlation which value is 0.276, which with 2-tailed significance shows that there are weak links in the use of Netspeak elements and the quality of discussion. Or we can accept the hypothesis that students who are more active or have a better discussion more often used Netspeak than the less active students.

5. CONCLUSION

This paper develops ten standards in using Netspeak when communicating on-line and testes two hypotheses. The first one is that there is a correlation between the use of each Netspeak standard within the each group and the results confirmed this hypothesis. Although, only the use of words in English, use of acronyms and abbreviations and emoticons show high correlations while all others shows low correlation. This was expected due to the nature of the ICT course strongly oriented to overwhelming use of English language and its common feature of using acronyms and abbreviations. In terms of using emoticons in such a high rate it was also expected because symbols became very popular way of expressing a variety of feelings.

The results confirmed the second hypothesis as well and that is that the more active students or the students having the better quality discussions use more often the Netspeak elements then the less active students.

The standards are developed according to their provenience and grouped into four categories. The first one is ICT, considering standards that arise in the information communication technologies environment. The second one consists of standards linked to the grammar provenience and in the field of the third one arise the standards evoking prosody effects. The authors developed the fourth group, called "other" involving the use of an obsolete tense – aorist. The authors expect broadening of the standards as the new language will change and expand as well as the increase of the number of existing categories paralleling the growth of the new phenomena.

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Digital Crime and Punishment: Turkish Online Journalism under Siege

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ABSTRACT

Turkish mass media since its beginnings in late 19th century has aimed to gain its role as the fourth estate in Turkish political scene. The freedom of press has been at the paramount of discussions since the foundation of the Turkish Republic in 1923. Between 1980 and 2000 Turkish media grew more and more liberal and was able to express discontent publicly exercising its checks and balances function. On the other hand, the conservative majority of AKP government, the governing party in Turkey, brought back pressures on the Turkish media since the 2000s. Digital media, as the new developing platform in Turkey for expressing rights and freedoms, is under siege by government as well. The government's definition of digital crime and punishment is mostly unnoticed by the average citizen but despised by the young population. This paper intends to show the invalidity of disproportionate use of punishment and illegitimate definition of cybercrime in contemporary democratic systems that target online media professionals and outline how Turkish authorities can reverse the process by adopting alternative strategies of prevention. Under this perspective, it also assesses the compliance of Internet legislation and practices in Turkey with Article 19 of the Universal Declaration of Human Rights, Article 10 of the European Convention on Human Rights as well as the case law of the European Court of Human Rights.

Keywords: Internet, media, censorship, legislation, cybercrime, Turkey.

INTRODUCTION

Whenever new media platforms have been introduced, they were met with scepticism, mostly because of the fear that they could be capable of oust the governments from power. Therefore, new media have always been liable to excessive regulation as the governments banned certain content from publication in printing press and from airing in radio and television. They believed that all these mediums may have potential detrimental effects on the stability of governments structures and society. With the invention and adoption of the Internet during the 1990s, governments feared the power of this borderless new medium and they have begun to bring restrictions on it. [1]

Today, since they have digitally transmitted, information and content are widespread available through the Internet. This means the loss of control of states on digital content."The increasing popularity of user-driven interactive Web 2.0 applications and services such as YouTube, Facebook and Twitter seem to eliminate virtual Internet borders even further by creating a seamless global public sphere. This, inevitably complicates state-level efforts to find an appropriate balance between the universal right to freedom of opinion and expression, which includes the right to receive and impart information, and the prohibition on certain types of content deemed illegal by nation-state authorities or intergovernmental organizations."[2] As a result, the regulation of online content has become a hot button issue.

Some countries around the world including Turkey enforced policies to block access to Internet content that deemed illegal. It looks like blocking access to Internet is being applied and adopted in increasing number of states, with some practices to restrict users' access to the Internet and Web 2.0 based social media platforms which are outside their jurisdiction. These practices and legal measures are analyzed in this paper.

Current Media Censorship in Turkey

After a major win in the 2010 constitutional referendum, Turkish Prime Minister Recep Tayyip Erdogan convened a large gathering of all media representatives and to their shock he has declared a set of principles under which the media should operate in reporting news.[3] This approach contrasted with a previous announcement made after his second majority win in general elections in 2007 that had stated empathy and understanding for those who did not vote for him and that he would be open to criticism of all kinds from all parties.[4] The following three years proved to be otherwise for journalists from all types of political orientation. Currently hundreds of journalists are arrested and awaiting trial for allegedly trying to overthrow the government through violent means, charges based on phone tapping, unidentified witness accounts and some journal entries by military officials, proof yet to be seeing the light of day in a courtroom. There is a consistent drop in Turkey's place in global human rights watch lists concerning freedom of press since 2007. Freedom House Report on Internet states that user rights are violated, users are blocked from reading and writing content and that there is "substantial political censorship".[5] The report dated July 12, 2011 by Thomas Hammarberg, the commissioner for Human Rights of the Council of Europe, after his trip to Turkey between April 27-29, 2011 shows various concerns on the freedom of press in Turkey. Hammarberg states that there is "increase in criminal proceedings and arrests involving journalists in Turkey… The excessive length of criminal proceedings and remands in custody…"[6] Paris-based Reporters without Borders has recently published its annual index chronicling Turkey's decline: at "No.

[1] OSCE Report on Freedom of Expression on the Internet, http://www.osce.org/fom/80723. Accessed on Jan.11, 2012.

[2] Ibid.

[3] Judson, David (2010). Erdoğan seeks to turn 'new page' with Turkey's news media *Hurriyet Daily News*, Sept 25. http://212.31.2.101/n.php?n=erdogan-seeks-to-turn-new-page-with-turkeys-news-media-2010-09-25. Accessed on Jan 11, 2011.

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[5] Freedom House (2011) http://www.freedomhouse.org/images/File/FotN/Turkey2011.pdf.

[6] Hammarberg, Thomas(2011), in Report on Freedom of expression and media in Turkey, https://wcd.coe.int/ViewDoc.jsp?id=1814085. Accessed on Jan 12, 2012.

148" on the RWB list, behind Malawi and the Congo "but mercifully still ahead of Mexico and Afghanistan."[7]

The negative government practices to news media of all forms point towards the establishment of a new neo-liberal media autocracy in Turkey. Egemen Bağış, minister in charge of EU Affairs, claims in a newspaper article, "Actually, the AK Party is the most reformist and most liberal government in Turkish history."[8] On the other hand, print and broadcast media reporters are feeling all time high pressure for self-censorship. David Judson of *Hurriyet Daily News* describes the pressure of writing as a journalist with these words: "Shall I characterize in this column, for example, the details of the government's response and position on these issues? Backspace. Delete. Backspace. Delete. A tiny example of self-censorship at work."[9]

This article accepts the media freedom to report on news without restriction or censorship as one of the defining qualities of a liberal democratic system and proposes to examine the restrictions on the digital media as a new form of censorship; this hence is the violation of media freedom in Turkey. In the line with Freedom House's Freedom on the Net 2011 Report, there are three problematic areas in regard to Internet and digital media freedoms in Turkey: obstacles to access, limits on content, and violations of user rights. Each of these areas will be analyzed in the light of examples, and alternative strategies will be proposed to government on how to regulate new media platforms.

Regulations on New Media in Turkey

The number of Internet users in Turkey has increased to 35 million as of 2011, showing a penetration of 45 percent, which was only 7.5 percent in 2004 and 13.9 percent in 2005. This makes Turkey the thirteenth largest internet population in the world and fifth biggest internet population in Europe (after Germany, Russia, UK and France). The Internet is widely popular among the youth, and with 31 million users Turkey is the sixth largest country in the world on Facebook. But not only on Facebook, the Turks are also very active on other services. 96% of online users use social media in Turkey. Turkey is the number 1 country on Friendfeed and the number 8 country for TwitteR on terms uf the numbers of the users.[10]

Obstacles to Access: Despite the general popularity of online social media platforms, it can be speculated that the population cannot enjoy them without being restricted. As a right, freedom of expression is recognized and protected by the Turkish Constitution through Article 26, and human rights treaties to which Turkey is a party. Turkish law and court judgments are also subject to the European Convention on Human Rights and are bound by the judgments of the European Court on Human Rights. Article 28 of Turkish Constitution states, "the press is free and shall not be censored," but the judiciary of Turkey has an authority to censor all media outlets under constitutional provisions and loosely interpreted laws, especially on the grounds of "protecting basic characteristics of the Republic" and "safeguarding the indivisible integrity of the State with its territory and nation."[11]

On May 4, 2007, Law No. 5651 entitled *Regulation of Publications on the Internet and Suppression of Crimes Committed by means of Such Publication* was enacted by the government. With this law, Turkey provided the broadest legal measures for blocking access to websites by specifying eight different content related crimes, which will be explained below. Users of the blocked websites have filed cases with the European Court of Human Rights, after unsuccessfully appealing the ban in local courts. The infamous YouTube block was lifted in November 2010 only after disputed videos were removed or made unavailable within the country.

Besides the older media control and censorship association, RTÜK (Radio and Television Supreme Council), a new governmental association, TIB (Telecommunications Communication Presidency), can impose bans on Internet sites without prior judicial approval, if the offending Web site hosts content that is illegal under Turkish law and is hosted outside Turkey, or a Web site contains sexual abuse of children or obscenity and its host resides in Turkey. The Information and Communication Technologies Authority and the TIB, which it oversees, act as the regulators for all of these Technologies. However, the fact that board members are government appointees is a potential threat to the authority's independence, and its decision-making process is not transparent. TIB also oversees the application of the country's website-blocking law, and is often criticized by pressure groups for a lack of transparency.[12]

According to Law No.5651, the Telecommunications Communication Presidency (TIB) was given duty to execute court orders to block websites and issue blocking orders for the content providers in or outside Turkey for committing crimes listed in Article 8 of Law No. 5651. The law prohibits:[13]

- crimes against Atatürk (Article 8/b),
- offering or promoting prostitution,
- providing place and opportunity for gambling,
- unauthorized online gambling and betting,
- sexual abuse of children,
- encouraging suicide,
- supplying drugs that are dangerous for health, and
- facilitation of the abuse of drugs.

Web sites are also blocked for the following reasons:

- downloading of MP3 and movies in violation of copyright laws,
- insults against state organs and private persons
- crimes related to terrorism
- violation of trademark regulations
- unfair trade regulated under the Turkish Commercial Code
- violation of Articles 24, 25, 26, and 28 of the Constitution (freedoms of religion, expression, thought, and freedom of press).

[7] Judson 2012.
[8] Bagis, Egemen (2011). "Turkish experience for Europe: invest in democracy" Nov. 29, 2011, http://www.europolitics.info/externa-policies/turkish-experience-for-europe-invest-in-democracy-art319518-41.html.
[9] Judson 2012.
[10] http://www.ejc.net/media_landscape/article/turkey/. Accessed on Feb.2, 2012.
[11] Ibid.
[12] Freedom on the Net 2011 Report, http://www.freedomhouse.org/report/freedom-net/2011/turkey. Accessed on Feb.4, 2012.
[13] http://en.wikipedia.org/wiki/Censorship_in_Turkey#Laws. Accessed on Feb.4, 2012.

Article 8 blocking provisions were extended in January 2008 and are applicable in matters concerning football and other sports betting websites. Websites which enable users to play games of chance via the Internet and which are based outside the Turkish jurisdiction and lack valid licence or permission are also susceptible to blocking.[14] More recently, in February 2011, the blocking list was extended to include websites which sell and provide alcohol and tobacco related products to those under the age of 24. Websites that carry content subject to Article 8 could be taken down if hosted in Turkey or blocked and filtered through Internet access and service providers if hosted abroad.

Certain crimes such as the dissemination of terrorist propaganda (Articles 6 and 7 of the Turkish Anti-Terror Law No. 3713), or crime of 'denigrating Turkishness', (Article 301, Criminal Code), or hate crimes (Article 216 of TPC) are not included within the scope of Article 8. "Therefore, neither the Courts nor TIB can block access to websites based on reasons outside the scope of Article 8."[15]

Law No. 5651 refers to Article 41 of the constitution about the duty of the Parliament in protection of families, children, and youth. Related article states, "the state shall take the necessary measures and establish the necessary organisation to ensure the peace and welfare of the family, especially where the protection of the mother and children is involved".[16]

Law No. 5651 enables not only the courts of law to issue judicial blocking orders, but also an administrative body, the Telecommunications Communication Presidency (TIB) to issue administrative blocking orders. Blocking orders would be issued by a judge during a preliminary investigation and by the courts during trial. On the other hand, admnistrative blocking orders would be issued by TIB for crimes listed in Article 8(1) when the content and hosting providers are situated outside the Turkish jurisdiction. TIB can also execute administrative blocking orders with regards to content and hosting companies based in Turkey if the content in question involves sexual exploitation and abuse of children (Article 103(1) of the Turkish Penal Code),80 or obscenity (Article 226 of the Turkish Penal Code).[17]

An interesting detail should be noted that "the law does not require these crimes to be committed on the websites, and a 'sufficient suspicion' is enough for a court or for TIB to issue a blocking order. The Article 8 provisions do not clarify or establish what is meant by 'sufficient suspicion'."[18] According to data compiled by Akdeniz in OSCE report,[19] out of 475 court orders issued by May 2009, 121 websites were blocked because they were deemed obscene (Article 226 of the Turkish Penal Code), 54 websites were blocked because they involved sexual exploitation and abuse of children (Article 103(1) of the Turkish Penal Code), 19 websites were blocked because of provision of gambling (Article 228 of the Turkish Penal Code), 20 were blocked because they involved betting, and 54 websites were ordered to be blocked in relation to crimes committed against Atatürk (Law No. 5816, dated 25/7/1951).

The same report reveals that out of the 2126 administrative blocking orders issued by TIB, the majority, with 1053 blocking orders involved sexual exploitation and abuse of children (Article 103(1) of the Turkish Penal Code), 846 involved obscenity (Article 226 of the Turkish Penal Code), 117 involved football and other sports betting websites (Law No. 5728, article 256), 74 involved gambling sites (Article 228 of the Turkish Penal Code), 20 involved prostitution websites (Article 227 of the Turkish Penal Code), 11 involved websites facilitating the use of drugs (Article 190 of the Turkish Penal Code), 2 involved crimes committed against Atatürk (Law No. 5816, dated 25/7/1951), and one involved encouragement and incitement of suicide (Article 84 of the Turkish Penal Code). By looking at this data, it can be said that "the number of websites blocked outside the scope of Article 8 by the courts was 69 in May 2008 but reached nearly 200 by the end of May 2009."[20]

An OSCE report published in January 2010 stated that approximately 3,700 websites had been blocked from Turkey since the enactment of Law No. 5651.[21] The application of Law No. 5651 resulted in blocking access to a considerable number of foreign websites including prominent sites such as YouTube, Geocities, DailyMotion, Metacafe,856 Google Sites, Playboy, and Rapidshare. Similarly, websites in Turkish, or addressing Turkey-related issues have been subjected to blocking orders under the Law No. 5651. This has particularly affected news websites such as Özgür Gündem, Azadiya Welat, Keditör, Firat News, and Günlük Gazetes that are reporting on southeastern Turkey and Kurdish issues. Gabile.com and Hadigayri.com, which form the largest online gay community in Turkey with approximately 225,000 users, were also blocked during 2009. Regarding the YouTube ban that lasted almost two and a half years, three separate applications have been made to the European Court of Human Rights between 2009 and 2011.[22] The Strasbourg Court is yet to decide whether to assess further these applications and possible violations of Article 10.

Limits on Content: In accordance with Law No. 5651, judges can issue blocking orders during preliminary investigations as well as during trials. It is often difficult for site owners to determine why their site has been blocked and which court issued the order. According to TIB statistics as of May 2009, the courts are responsible for 21 percent of blocked websites, while 79 percent are blocked administratively by the TIB. Law No. 5651's primary objective is to protect children from illegal and harmful internet content, but the law's broad application to date has restricted adults' access to legal content dramatically.

In June 2010 Turkish activists challenged legally against the government's controversial move to block Google related services. This was a reaction to 44 IP addresses jointly used by YouTube and Google being initially blocked by the TIB, and then by the Ankara's 1st Criminal Court of Peace. The reason behind the IP address blocking was to make it even harder to access YouTube from Turkey (which had been already blocked since May 2008) but the IP blocking paralyzed access to numerous Google-related services such as Analytics, Translate, Docs, Books, Map, and Earth. However, following the

[14] Law Amending Some Acts to Harmonise Criminal Law No 5728, Article 256. Official Gazette, 23.1.2008, No. 26781.
[15] OSCE Report on Freedom of Expression on the Internet.
[16] Article 41, Turkish Constitution.
[17] OSCE Report on Freedom of Expression on the Internet.
[18] Ibid.
[19] Akdeniz, Y. Report of the OSCE Representative on Freedom of the Media *on Turkey and Internet Censorship*, January 2010, <http://www.osce.org/documents/rfm/2010/01/42294_en.pdf>. Accessed on Mar. 2, 2012.
[20] OSCE Report on Freedom of Expression on the Internet.
[21] Akdeniz, Y., Report of the OSCE Representative on Freedom of the Media *on Turkey and Internet Censorship*, January 2010, <http://www.osce.org/documents/rfm/2010/01/42294_en.pdf>. Accessed on March 2, 2012.
[22] The European Court of Human Rights published the statements of facts in February 2011, and asked the government of Turkey to respond by June 2011.

unblocking of YouTube in November 2010, access to other Google services was restored.[23]

Violations of User Rights: The constitution states that "secrecy of communication is fundamental," and users are allowed to post anonymously online. The constitution also specifies that only the judiciary can authorize interference with the freedom of communication and the right to privacy. For example, judicial permission is required for technical surveillance under the Penal Procedural Law. Despite the constitutional guarantees, most forms of telecommunication have been tapped and intercepted in practice. Between 2008 and 2009, several surveillance scandals received widespread media attention, and it has been alleged that all communications are subject to interception by various law enforcement and security agencies, including the Gendarmerie (military police). Some reports indicate that up to 50,000 phones—both mobile and land-line—are legally tapped daily in Turkey, and 150,000 to 200,000 interception requests are made each year.[24] During 2009 it was alleged that phone conversations involving members of the parliament, journalists, Supreme Court and other judges, and prosecutors including the chief public prosecutor were tapped.[25]

TIB, on its website, publishes approved filtering programs that mass-use providers are required to use. However, according to which criteria these programs are approved remain unknown and it is also unclear whether the approved programs filter websites other than the ones formally blocked by the courts and the TIB. This could result with the systematic censorship of websites without the necessary judicial or TIB orders.

On August 22, 2011, the Information Technologies and Communication Board (BTK) set up some procedures for the safe use of Internet, which would have forced all home subscribers to choose one of four filtering profiles. These profiles were the standard profile, children's profile, family profile and domestic Internet profile. But after the strong criticism and reaction againt the proposal, the filtering system has been modified on 22 November 2011 and was made non compulsory for the users. The new version also included only the family and child profiles. However ISPs are still compelled to offer the filtering service to their customers and the filtering database and profiles are controlled and maintained by the government.[26]

The Compatibility of Turkish Internet Legislation with International Laws

Turkey has been found in violation of international standards for suppressing alternative views and mass media organisations in the past.[27] While a 'degree of control' is still possible for traditional media outlets, it has become harder for the governments to control alternative ideas spread through various Internet communication tools and social media platforms. Freedom of expression is seen not as an absolute right and might be subject to limitations provided in the Turkish Constitution and international treaties.

As was discussed above, the Law No. 5651 has led to the blocking of over 3700 websites as of December 2009. However, neither TIB nor the courts have given clear guidance on what kind of web content results in this most restrictive type of measure. Those visiting blocked websites in Turkey could only see that the website is blocked due to a court order or TIB decision. The notices provided on the blocked pages do not provide any information on which catalogue crime (Article 8 of Law No.5651) has been committed or suspected on that website, or information on any other legal provision triggering the blocking orders. The reasons for the blocking decisions are not made public, nor declared to the content providers or website owners. This lack of guidance leads to uncertainty and arbitrary application of Law No. 5651 by the courts and TIB with regards to its administrative decisions. Research conducted by Akdeniz & Altiparmak has shown that some blocking orders given by the Courts have no legal basis under Law No. 5651, and are issued outside the scope of the new provisions. [28]

The blocking policies of the government undoubtedly has a chilling effect on freedom of expression, which is one of the founding principles of democracy. As in the case of YouTube, blocking websites could be incompatible with Article 10, and could be regarded as a serious infringement on freedom of speech, and too farreaching than reasonably necessary in a democratic society. The fact that society may find speech harmful and offensive should not be a sufficient reason for suppressing that content, such as in the case of YouTube. In fact, such speech and content may be protected by Article 10, ECHR, and the related jurisprudence of the European Court of Human Rights. It is obvious that the illegal content does not vanish as a result of blocking access to websites. Those who live outside Turkey or those who know how to access YouTube and other banned websites from within Turkey can still access the suspected content.[29] Banning socially useful websites is also damaging for political expression. These sites provide a venue that is popular across the world for alternative and opposition views.

Alternative Strategies on How to Regulate New Media

Everyone should have a right to access information in democratic societies and states have a responsibility to provide citizens' access to the Internet is guaranteed. Internet access policies, defined by governments, should be in line with the requirements of Article 19 of the Universal Declaration of Human Rights as well as Article 19 of the International Covenant on Civil and Political Rights and (where applicable) with Article 10 of the European Convention on Human Rights. While certain countries and international organizations, such as the United Nations, may recognize Internet access as inherent to the right to free expression, some other governments have adopted policies to block access to the Internet.

Regarding speech- and content-related laws and legal measures, any restriction must comply to international and regional human rights law. According to the European Court of Human Rights jurisprudence, a strict three-part test is required for any content-based restriction. The Court notes that the first and most important requirement of Article 10 of the Convention is that

[23] Freedom on the Net 2011 Report.
[24] Ibid.
[25] "Başsavcı Engin dinlenmişve takip edilmiş" [The Chief Public Prosecutor's Calls Are Tapped]," *Radikal*, November 12, 2009.
[26] OSCE Report on Freedom of Expression on the Internet.
[27] *Özgür Gündem v. Turkey*, App. no. 23144/93, 16.3.2000.
[28] Akdeniz, Y., & Altiparmak, K (2008). *Internet: Restricted Access: A Critical Assessment of Internet Content Regulation and Censorship in Turkey,* Ankara: Imaj Yayinevi.
[29] OSCE Report on Freedom of Expression on the Internet.

any interference by a public authority with the exercise of the freedom of expression should be lawful. If the interference is in accordance with law, the aim of the restriction should be legitimate – based on the Article 10(2) – and concern limitations in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health of morals or for the protection of the rights and freedoms of others. Furthermore, any restrictions need to be necessary in a democratic society and the state interference should correspond to a "pressing social need". The state response and the limitations provided by law should be "proportionate to the legitimate aim pursued". "The Article 10 compatibility criteria as set out by the European Court of Human Rights should be taken into account while developing content related policies and legal measures by the government."[30]

It is worth noting that content regulation developed for traditional media cannot and should not simply be applied to the Internet. Recognizing this, some countries have developed new measures dealing only with online content. "This increased legislation of online content has led to challenging restrictions on the free flow of information and the right to freely impart and receive information on and through the Internet."[31] Access to information should be seen as a right and freedom by governments, without making distinctions between traditional and digital media, and any blocking mechanism that could restrict users' access should be avoided.

In Turkey, hundreds of journalists are prosecuted and jailed, facing criminal charges. Media serves as the fourth estate and inevitable part of democracies. However, if the journalists cannot write or report on matters of public importance, without fear of criminal prosecution, this means that one of the founding principles of democratic societies is severely damaged. Specific examples include the case of journalist Nedim Şener and OdaTV indident. The arrest and condemnation of Nedim Şener, an online journalist, before his critical book on AKP government is published, marked blow to the online rights of Turkish media professionals. OdaTV, a popular online website and its bloggers were also arrested on accounts of terrorism for the alleged "attempt to overthrow the government through violent means as an organized crime group".

Another problematic area is for governments not keeping and revealing statistical data on convictions under relevant law(s) pertaining to online content regulation. Without the presence of reliable statistical data, it is not possible judge and reach conclusions on whether content related crimes were committed over the Internet. Therefore, governments should spent effort on collecting these data and make them publicly available.

CONCLUSIONS AND RECOMMENDATIONS

Freedom of expression applies to all means of communications, including the Internet. Any restriction on it should be weighted against the public interest. Governments need to take action to ensure that the Internet remains as an open and public forum for freedom of opinion and expression. States should keep in mind the borderless nature of the Internet when developing online content regulation policies. Restrictions introduced by law should be proportional and in line with the requirements of democracy as was argued in this paper.

Definitional problems and inconsistencies exist related to certain speech-based restrictions. Clarifications are needed to define what amounts to 'extremism', 'terrorist propaganda', 'harmful' and 'racist content' and 'hate speech' since the legal provisions are often vague and open to subjective interpretation.

Prior restraint and bans imposed on the future publication of entire online content, or for that matter websites such as YouTube, are incompatible with the European Convention standards. Based on legal and procedural deficiencies related to Law No. 5651 practice, it is speculated that the Turkish government should urgently modify Law No. 5651 in line with international standards on freedom of expression, independence and pluralism of the media, and the free flow of information. It is also argued that the government should establish a grand public inquiry to develop a new policy which is truly designed to protect children from harmful Internet content while respecting freedom of speech, and the rights of Turkish adults to access and consume any type of legal Internet content.[32]

The Information and Communication Technologies Authority (BTK) has recently been declared the development of a state sponsored Turkish search engine which will reflect upon 'Turkish sensitivities.' There is a potential for government to use this tool for censorship in the future. Legal authorities should carefully watch the development of this engine and raise their concerns if it is used to restrict online content.

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[11] Ibid.
[12] **Freedom on the Net 2011 Report**, http://www.freedomhouse.org/report/freedom-net/2011/turkey. Accessed on Feb.4, 2012.

[30] Ibid.
[31] Ibid.
[32] Ibid.

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[17] **OSCE Report on Freedom of Expression on the Internet**.
[18] Ibid.
[19] Y. Akdeniz, **Report of the OSCE Representative on Freedom of the Media on Turkey and Internet Censorship**, January 2010, <http://www.osce.org/documents/rfm/2010/01/42294_en.pdf>. Accessed on Mar. 2, 2012.
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[23] **Freedom on the Net 2011 Report**.
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Preservice Mathematics Teachers' Solutions to Problems: Conversions within the Metric System

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Abstract:

This paper reports on the results of a preliminary investigation to determine if preservice mathematics teachers solve conversion problems within the metric system in multiple ways. Here, four metric conversion problems of escalating difficulty were administered within a mathematics methods course at a comprehensive state university in the Northeastern United States. Results show that preservice teachers solved the problems in the same way that they were taught in high school, and that in high school they were only taught one way.

Introduction

The argument for enhanced STEM education is well known in both the K-12 arena and within higher education. Many current initiatives call for improved inclusion of Science, Technology, Engineering, and Mathematics (STEM) topics in the high school curriculum. The Presidents Council of Advisors on Science and Technology (PCAST) called for the creation of STEM-related experiences for today's students while transforming schools into "vibrant" scientific learning communities (PCAST, 2011). The National Research Council (NRC) advocated that in order to support the United States economic well-being and foster scientific innovation, today's schools need increased student participation in science related coursework (NRC, 2011). One of the fundamental topics of both the mathematics and science curriculum is the metric system. The NRC report calls for teachers, and by extension, preservice teachers to be trained in teaching the required material, and also to develop the teaching capabilities and knowledge to help the youth of today be successful in future STEM careers.

The NRC report documented how children best learn STEM topics and noted that when students see connections and relevance to their coursework in school, they become motivated and are more likely to pursue careers in the science world. In order to create vibrant STEM learning communities, teachers need to develop comfort and flexibility in effective teaching strategies, particularly while teaching the metric system (DeMeo, 2008). This topic is also of central issue to the Common Core State Standards for Mathematics (CCSS, 2011) initiative, which calls for students to understand the structure of mathematics and apply that structure to other areas of the curriculum such that skills and understanding are developed together. However, scant research exists on developing teachers' knowledge to effectively teach conversions within the metric system (DeMeo, 2008). Therefore, this study seeks to examine the results of a preliminary pretest instrument to determine how preservice mathematics teachers solve conversion problems within the metric system. Information learned from this preliminary study will be used to inform and guide a larger scale study of the development of preservice mathematics teachers' knowledge of teaching conversion problems within the metric system.

Theoretical Framework

The desirability of multiple solution methods in mathematics classes has been established for some time. Brenner et. al (1997) showed that students who receive representation training were more successful in representing and using different methods to solve a function word problem. The National Council of Teachers of Mathematics (NCTM) continues to advocate that "terminology, definitions, notation, concepts, and skills" (NCTM, 2000, p. 14) emanate from teaching with understanding, and supports the advantages of teaching with multiple methods. More current reviews of research demonstrate that in order for students to learn mathematics with understanding, teachers must be able to present the material within a framework that promotes conceptual and procedural understanding (Hiebert & Grouws, 2007; Rakes et al., 2010). Several studies within physics education (Feldman, 2002; Tao, 2001) established the value of multiple solution methods on classroom instruction. DeMeo's (2008) research on the role of multiple representations in science classes documented the need for specific instruction on multiple solution methods to solve conversion problems, namely the use of both proportional reasoning and dimensional analysis. DeMeo concluded that teachers of mathematics and science should work together to express multiple representations of data, including making the connections between proportionality and the use of linear plots because students who acquire only algorithmic knowledge of solving conversion problems may be unable to transfer their shaky understanding to more complex conversion problems used in science classes. If today's students are not prepared by their mathematics teachers to understand the structures inherent within the metric system and develop flexible ways of solving conversion problems, future work in science becomes increasingly difficult.

Methodology

The purpose of this study is to determine how preservice mathematics methods teachers solved four typical conversion problems. Fifteen undergraduate preservice mathematics teachers participated in the study as part of an education course in Mathematics Methods for grades 7-12. Participants included seven white females, and eight white males. All preservice teachers were also Mathematics majors at the same comprehensive public university (a dual-degree). Participants were asked to solve four different conversion problems within the metric system (as outlined in table 1) problem and explain their solution. Participants were also asked a corresponding set of qualitative questions:

1. Is the way you solved the problems the way that you were taught in high school?
2. Do you recall if your high school mathematics classes taught you multiple solution methods?

The problems appear below:

Problem 1	Express 50cm as mm. Explain the solution. *500 mm*
Problem 2	Express 450,000,000mm as km. Explain the solution. *450 km*
Problem 3	Express 26Gm as nm. Explain the solution. $26*10^{18}$ *nm*
Problem 4	Given 450mg of a substance occupying a volume of 50 mL (450 milligrams occupying a volume of 50 milliliters) Calculate the density of the substance in grams per liter. Explain the solution. *9g/L*

Table 1. Four problems using conversions within the metric system

Problems were administered on the first day of class before any other instruction on

multiple solutions methods was discussed or assigned. These problems are representative of typical conversion problems found in high school chemistry (Brown, LeMay, & Bursten, 2000) and mathematics (Bellman, et al, 2010; Gantert, 2007) textbooks.

Results

Results are tabulated by question as follows. In Problem 1 all preservice teachers solved it correctly as shown in Table 2. This problem represented the most basic conversion problem. Six students admitted in their explanations that they felt "rusty" or "it had been a long time since they had solved these problems." Three preservice teachers said that they pictured a ruler. Two preservice teachers wrote a staircase on their papers showing the often used mnemonic "King Henry Drank Milk During Class Monday," however one student wrote the mnemonic incorrectly as "King Henry's Mother Drinks Chocolate Milk." Four others stated they simply knew the conversion. This may indicate that that these six preservice teachers are not concerned with a solution for understanding but rather a procedural solution. Of the six students that used proportional reasoning the most often set of conversions were $50cm * \frac{1m}{100cm} * \frac{1000m}{1m}$. Of the three that used proportional reasoning, they set the problem up as $\frac{1\ cm}{10mm} = \frac{50cm}{x}$.

N=15 t	Express 50 cm as mm. Explain. 500 mm	
t	Number Correct	Number Incorrect
Mnemonic t	2 t	0
Dimensional Analysis	6 t	0
Proportional Reasoning	3 t	0
Other method	4 t	0

Table 2. Problem 1 Results

t In Table 3 below (problem 2), it is interesting to note that more participants turned to dimensional analysis. The one preservice teacher who used another method knew the meaning of these metric prefixes, and consistent with the first solution, the student simply counted the decimal places. This problem involved a larger magnitude of conversion and another preservice teacher lost track of their place value giving an incorrect solution that was off by one decimal place, i.e., the student moved the decimal five places to the right. This student used the mnemonic King Henrys Mother Drinks Chocolate milk (as described in Problem 1 above- omitting one of the words for "deca." The two preservice teachers who incorrectly used dimensional analysis had an incorrect conversion factors $\left(\frac{1km}{100m}\right)$ for a result of 4500; the other student used $\left(\frac{1km}{100ocm}\right)$ for a result of 45000. In summary incorrect solutions were based on an incorrect mnemonic or an incorrect understanding of the equivalent metric form of 1km.

N=15 t	Express 450,000,000 mm as km. Explain.	
t	Number Correct	% Number Incorrect
Mnemonic t	1 t	1
Dimensional Analysis	9 t	2
Proportional Reasoning	1 t	0
Other method	1 t	0

Table 3. Problem 2 Results

t In Table 4 below (problem 3), 14 of 15 preservice teachers could not solve the problem. Seven preservice students admitted that they did not know the meaning of the prefixes but they attempted a solution based upon dimensional analysis, and six simply

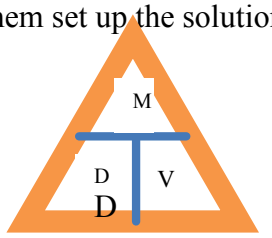
stated I can not solve the problem. The prefixes were less commonly used in high school mathematics classes, however, the term giga is used often in today's computing realm. The seven who attempted the dimensional analysis solution used a potentially correct set-up of the problem had they known the mathematical meaning of the prefixes. These students reported a sense that the decimal should be moved to the right- but they were not sure how many places. It is possible that with a conversion chart for the meaning of the prefixes, more preservice teachers might have solved the problem correctly.

N=15 t	Express 26 Gm as nm. Explain.	
t	Number Correct	% Number Incorrect
Dimensional Analysis	1 t	8
Could not set up problem	0 t	6

Table 4. Problem 3 Results

In Table 5 (Problem 4), 13 of 15 students solved the problem correctly. All students applied the formula D = M*V. One student wrote that he remembered it as the "Department of Motor Vehicles." Two others wrote a triangle to help them remember how to set up the equation (see table 5). Another student interestingly used both the mnemonic "King Henry" above and then the equation D=M*V. Three students made an arithmetic mistake as follows: First, in the division of $\frac{450mg}{50mL} = \frac{90mg}{mL}$, second as $\frac{4.5}{0.05} = \frac{90mg}{mL}$ and finally as, $\frac{450mg}{50mL} = \frac{9mg}{mL}$.

Three also used this triangle mnemonic to help them set up the solution:



N=15 t	Given 450 mg of a substance occupying a volume of 50 mL (450 milligrams occupying a volume of 50 milliliters) Calculate the density of the substance in grams per liter. Explain.	
t	Number Correct	Number Incorrect
Dimensional Analysis	12 t	3

Table 5. Problem 4 Results

t Finally, in Table 6, the results of the two follow up questions are presented. 14 of the preservice teachers believed that they solved the problems the way in which they were taught in high school, and only two recall being taught multiple solution methods for problems like this in high school.

t	Number replied yes	Number replied no	Do Not Remember
Is the way you solved the problems the way that you were taught in high school?	14 t	0 t	1
Do you recall if your high school mathematics classes taught you multiple solution methods [for these types of problems]?	2 t	10 t	3

Table 6. Qualitative Questions Results

Resoundingly, this cohort of preservice teachers did not learn to solve these problems in multiple ways. This prohibited them from a meaningful check of their solution, and more importantly, they lack other teaching strategies or methods to teach the problems.

Discussion and Conclusion

The results of this preliminary study indicate that it is worthwhile to further study preservice teachers' solution methods of solving conversions within the metric system. The long standing problem of promoting the use of in-depth understanding through multiple methods is well known. Despite prior research that teaching based upon procedural *and* conceptual understanding is worthwhile, this particular cohort of preservice teachers seemed to gravitate towards the methods taught in high school. Many even used (incorrect) mnemonics. Without intervention, this pattern is likely to continue (DeMeo, 2008). The PCAST report suggested that the federal government should "ensure the recruitment, preparation, and induction support of at least 100,000 new STEM middle and high school teachers who have strong majors in STEM fields and strong content-specific pedagogical preparation, by providing vigorous support for programs designed to produce such teachers." (PCAST, P. 12). Therefore, future study is warranted on an intervention that might promote the development of teachers' knowledge to value and incorporate the use of problem solving, and in-depth understanding though the use of multiple methods for conversion problems. This future research should address the question: Can the in-depth study of unit conversion problems in a mathematics methods course encourage preservice teachers to create and refine models of teaching conversion problems within the metric system?

Furthermore, what is missing from these solutions are ways that focus on coherence and structure in the metric system and that align within the CCSS. At least two disparate methods are missing from these solutions- the use of scale factors to solve the problems (see Lappan, 1998), and the use of the meaning of metric prefixes to solve the problems such as applying the multiplicative identity:

> Express 450,000,000 mm as km:
> $10^{-3} \times 10^{3} = 1$
> insert the prefix you want to move to: kilo=10^{3}
> 450,000,000 mm =
> 450,000,000 x 10^{-3} m =
> 450,000,000 x 10^{-3} m x $\mathbf{10^{-3} \times 10^{3}}$ =
> 450,000,000 x 10^{-6} x 10^{3} m =
> 450 km

Using a mnemonic may indicate that preservice teachers do not know the meaning of the prefixes, so they were not able to use the structures of mathematics using exponents (as above) to devise a solution. When the preservice teachers were confronted with vastly different prefixes (like nano and giga), they could not rely on the structures of the prefixes to solve the problems. In short, they ran out of stairs to climb! Knowing a second or third way helps students to verify their solution and build confidence. The seminal work done by Shulman (1986) established that teachers can not teach what they do not know. Future research in the area of conversions within the metric system needs to promote the problem solving skills and use of multiple methods of preservice teachers so that they can, in turn, help their students.

Despite indications that conversions within the metric system are a worthwhile topic for further study, several limitations exist within this preliminary study. First, it is possible that if the preservice teachers were

given information on the meaning of the prefixes in problem 3, (nano and giga), they might have been able to solve the problem. Second, preservice teachers were asked if the method they used was the same as the method taught in high school, but the question did not specify mathematics or science classes. This should be clarified. Third, the preservice teachers overall preferred the DA method, and this is the method most typically used in the sample textbooks consulted. A more exhaustive review of the methods used in high school textbooks should also be a part of further study. Fourth, although the second follow up question indicated that preservice mathematics teachers were only taught one way to solve the problems, the follow up questions did not specifically ask preservice teachers to solve the problem in a variety of ways, nor did the study include appropriate qualitative participant interviews. In future research, the use of an initial survey should be followed by individual student interviews, include an appropriate intervention to promote the use of multiple methods, and finally a post test.

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Teaching Proofs to Elementary and Middle School Education Majors

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ABSTRACT

This paper presents strategies for presenting proofs in undergraduate courses targeted for future elementary and middle school teachers. Several pedagogic theories are cited including those of Van Hiele, Piaget, and Gagne. These theories suggest that teaching proofs at an early undergraduate level poses unique challenges since proof ability is a mathematically later development. This paper's approach utilizes several ideas including emphasis on experientially familiar domains of knowledge and use of specific theories of tutorial and instructional design. This paper's approach is broad: Students may be taught several sophisticated proof methods, including proof by cases, proof by contradiction, proof logic, lemma-theorem approaches, algebraic-geometric duality, motivating proof ideas with computer games and simulations, computer exploration for counterexamples, and computer exploration as a motivation for definitions. This paper illustrates proof methods from a variety of mathematical disciplines including geometry, number theory, and limits.

Keywords: Van Hiele, Gagne, Piaget, stages of development, Vygotsky, tutorial design, instructional design, Frieze, proofs, divisibility, constructive proofs

1. THE PROBLEM AND GOAL

The ability to prove mathematical theorems represents a high level of mathematical sophistication. Consequently, it is desirable to devote modules in teacher preparation courses for proof construction. This immediately presents a challenge, since undergraduate education majors may lack full mathematical maturity in this important and needed skill. Ideally, a graduating education major should be fully prepared to enter the workforce, teach, and perform all activities – including writing proofs -- expected of good teachers.

Several educational theorists – for example, Van Hiele, Gagne, Piaget, Vygotsky – have, in their research, specifically focused on the process of learner maturation. These theories postulate that the learner necessarily develops conceptual knowledge and builds skills based on activating, and mastery of, prior knowledge. Briefly examining these theories will heighten our appreciation of the problem mentioned in the first paragraph.

Van Hiele: Van Hiele specifically developed his theories of pedagogic development for geometry. Van Hiele posited five levels of development: *Visualization, analysis, informal deduction, formal deduction, and rigor*. The five Van-Hiele stages of development have several common distinct attributes: *fixed sequence, adjacency, distinction, separation and attainment*. Roughly, *distinction* and *separation* refer to the fact that learners in distinct stages of development use distinct language and phrases and consequently, because of their distinct usages, learners in distinct stages cannot fully communicate with each other and their instructors [2,3,14,15,17].

Gagne: Robert Gagne developed Hierarchical Learning. This theory identifies prerequisites that should be completed before the learner advances to a higher level of learning. He believed that all learners have to pass through these levels and no learner can skip a level. Gagne postulated eight distinct categories where learning can take place. Gagne observes a number of useful generalizations that can be made about all categories of learning. More specifically, Gagne introduced a sequence of nine levels that must be included in any effective learning: *attention, objectives, short-term memory, information presentation, performance, guidance feedback, assessment,* and *transfer* [4].

Piaget: Jean Piaget specifically studied development in children. He identified four stages of cognitive development: *sensory motor, pre-operational, concrete operational, and formal* [6].

Discussion: Commonalities of these three theories support the problem identified in the first paragraph of this section. For example, Piaget and Gagne enunciated a principle similar to Van-Hiele's *fixed sequence*: true learning, in any learner, can never bypass any of the stages. Preliminary studies suggest that Gagne's Hierarchal Principles are as effective as van Hieles' approach in learning geometry [18]. All three theories posit that abstraction and rigor are characteristic of terminal stages of development. This observation supports the idea that there is a problem or challenge in teaching proofs to undergraduate education majors.

2. PRINCIPLES OF INSTRUCTIONAL DESIGN

The Hartley, Lovelle and Ohllson theory of instructional and tutorial design [7,12] is one approach to solving the pedagogic problem raised in the first section. For convenience, in the sequel the acronym HLO refers to the approach of Hartley, Lovelle and Ohllson. HLO develops a theory of tutorial design based on a three-stage process of 1) a student cognitive model, 2) computer implementation of this cognitive model, and 3) a teaching strategy.

Hendel [9,10], examining several instances of the HLO model

observed the following subtle pedagogic nuances of the model:

1) Tutorial vs. Instructional design: HLO is simultaneously and equally a theory of *tutorial* design as well as a theory of *instructional* design. (This and the other observations will all be amply illustrated throughout the paper.)

2) Example sets: *Student cognitive model* frequently simply means a pedagogically *meaningful selection* of a subset of the universe of all problems in a domain of learning. More specifically, a domain of learning that poses difficulties for student learners, may become amenable to these learners if the full applicability of the domain is restricted to a *meaningful* subset of examples. Here, *meaningful subset of examples* simply means that the selected subset of problems is simultaneously rich enough to be challenging but restrictive enough to be doable by the student target audience.

3) Well defined: The 2nd HLO stage – *computer implementation* - makes the method appear technical, focused on tutorial design. However, *computer implementation* is equivalent to the *well definded-ness* of the subset of problems.

In summary the three stage tutorial design – *1) student cognitive model, 2) computer implementation, 3) teaching strategy* – has a natural one-one correspondence with a three stage instructional design – *1) a selected subset of rich but doable examples, 2) a clear definition and characterization of this set of examples,* and *3) a teaching strategy specifically focused on the attributes of this subset of examples.*

An alternative formulation of the above is the following: The HLO approach to tutorial design presents a dynamic interaction between technology and instructional design. Unlike the popular model of an instructor handing a targeted problem domain to a programmer who *serves* the instructor by building technology that facilitates the instruction, in HLO the instructor and programmer dynamically interact to produce together both instructional and tutorial design.

Application: In the remainder of the paper, example subsets of proof problems -- rich enough to challenge students but restrictive enough to be doable even to students not yet at the terminal stages of pedagogic development – are presented. The basic idea is to restrict our proofs to examples *experientially familiar* to students.

To use the Van Hiele terminology, this paper combines the advanced *rigor* stage with the preliminary *visualization* stage; to use the Gagne terminology, this paper combines the advanced *transfer* stage with the introductory *attention* stage; or to use the Piagetian terminology, this paper combine the *formal* stage with the *sensory motor* stage.

Additionally, in this paper, the term proof broadly includes verifications and definition explorations provided they have formal content. As shown in the sequel, verifications and definition explorations are a legitimate and intrinsic component of many proofs.

It is useful at this point to more specifically discuss the pedagogic goals of this paper. Many instructors are satisfied with education- major *recognition* of proofs and do not always require sufficient mastery for full *replication*. These instructors may for example assess ("test") students on their ability to identify components of the proof process but may not necessarily require a complete proof of an unfamiliar statement ("transfer").

Such a goal is consistent with Vygotsky's theories of education [6,13]. Vygotsky claims that learning takes place in *the zone of proximal development*, that is in tasks slightly above one's present level of development. The learning takes place with the help of a teacher who facilitates *guided discovery* by the student. These ideas of Vygotsky correspond neatly to our suggestion of restricting proofs to domains experientially familiar to the student.

Consistent with this approach of Vygotsky, several current textbooks for student teacher preparation emphasize exploration, guided discovery, and pattern recognition (e.g. [1]). This paper's contribution to this popular approach is twofold:

- This paper shows how pedagogic use of pattern exploration and recognition naturally emanates from the pedagogic theories of Van Hiele, Piaget, and Gagne.

- Section 5 offers a precise method of student diagnosis, assessment, and remediation, based on these pedagogic theories. The assessment method presented allows the instructor to decide which students should only be exposed to proofs and be able to recognize them and which students should be expected to produce complete proofs in unfamiliar terrain.

With this background, the rest of this paper explores several examples.

3. FRIEZE PATTERNS

A delightful discovery in the early 1990s, was the unexpected fact that the groups of invariant *symmetries* of the pottery and apparel of a variety of cultures were distinct. In other words, one can associate to distinct cultures distinct abstract mathematical objects [5,16].

Just to clarify our terminology, the term *symmetries* refer to *horizontal, vertical and translational symmetries.* Examples are compactly illustrated in Figures 1,2,3,4 below.

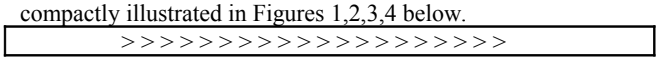

Figure 1: An example of *horizontal* symmetry. Rotating the figure about an imaginary horizontal center line joining the right most vertices of all motifs leaves the figure *invariant*, that is the same.

Figure 2: An example of *vertical* symmetry. Rotating the figure about any imaginary vertical line through the bottom vertex of a "V" leaves the figure *invariant*, that is the same.

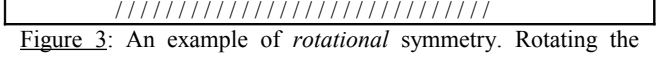

Figure 3: An example of *rotational* symmetry. Rotating the figure 180 degrees about an imaginary midpoint of one of the slanting-lines motifs leaves the figure *invariant.*

XXXXXXXXXXXXXXXXXXXXXXXX

Figure 4: A complex *symmetry* example. The figure of "X"s has both *horizontal, vertical* and *rotational* symmetry.

To appreciate the difficulty in identifying ("proving the presence of") general symmetry patterns, take any reasonably rich dress, blanket, or vase and try listing its symmetries. True, with practice, one could "learn" to instantly classify these patterns but typically one is dealing with a small time-frame, say one module of a typical 15 week semester in which students are exposed to a variety of proofs.

Applying HLO and using student interviews, it was found that students more easily recognized one dimensional symmetries when they could mentally superimpose the pattern motifs on a clock background. This motivates developing and defining the concept of a *clock-motif*. An example with discussion is presented immediately below in Figure 5 [8].

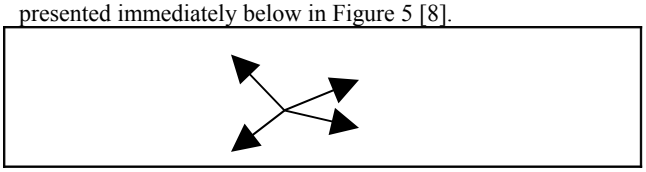

Figure 5: A simple *clock motif*. The central vertex connects to four vertices which, on an imaginary imposed clock, lie at positions 2 o'clock, 4 o'clock, 7 o'clock and 11 o'clock. Notice that the 2 o'clock and 4 o'clock "clock hands" have identical length. Similarly the 7 o'clock and 11 o'clock, clock hands have identical length. Therefore, this clock motif has *horizontal* symmetry but has neither *vertical* nor *rotational* symmetry. The pattern can be enhanced by repeating the motif across the figure thus giving the pattern an additional *translational* symmetry.

Application of HLO to pattern recognition:

1) Cognitive model (example restriction): Restrict teaching pattern recognition to patterns whose underlying motifs are clock motifs.

2) Concise definition: (a) Use one dimensional (vs. two dimensional) patterns. These are called Frieze patterns. (b) Allow multiple motifs in one dimension. (c) All underlying motifs should satisfy the criteria for clock-motifs (The criteria are presented heuristically in Figure 5. For a formal definition, see [8]).

3) Teaching strategy: Facilitate recognition of patterns using the imaginary clock backgrounds. An example of how clock-motifs naturally motivate teaching strategies, is the fact that each symmetry pattern has a numerical test naturally arising from the basic algebra-geometry duality.

   For example a motif has horizontal symmetry if and only if every "clock hand" has a corresponding "clock hand" which sums to a time ending on the half hour. So for example, in Figure 5, 2+4 = 6 (modulo 12 hours) and similarly 7+11 = 18 = 6 (modulo 12 hours).

Discussion: There are several salient points in introducing these clock-motif recognitions in an undergraduate education setting:

(1) Verification proofs: Superficially, the above methods appear to be a *recognition* problem. However, this recognition of patterns is accomplished through *proving* that a given motif possesses certain symmetries and does not possess other symmetries. Technically this corresponds to a *verification proof,* a proof enumerating a set of cases and verifying certain properties in each case.(See (4) below for details).

   Mathematical proofs have a richness ranging from constructive and verification proofs to sophisticated existential proofs. Verification proofs shed considerable light on the theorems proved and have intrinsic mathematical interest. The next Section 4, studies the sister category of constructive proofs.

(2) Complexity: Depending on the student level, the same cognitive model can be developed at various levels of complexity. For example, patterns can have several clock motifs; each clock motif may have several "hands" and of varying lengths; nested patterns, where the terminal vertices on a "big clock" are themselves small clock motifs are also possible.

(3) Number-Geometry duality: As already indicated, an important principle of mathematics (and of proofs) is the duality -- the one-one correspondence -- between numbers and geometry. By introducing numerical tests for specific symmetries, the instructor exposes students to a crucial mathematical and proof skill.

(4) Logical issues: A well-known foible – of both undergraduates and 1st year graduate students – is the lack of distinction between the need for only *one* counterexample for disproof and the need to prove *all cases* for full proof. In other words, to prove, for example, that a given figure *does not* possess say horizontal symmetry it suffices to show *some* "clock hand" –say "2 O'clock" - that does not have a complementary "hand" (in this case 4 O'clock). However, to prove that the given figure *does* possess horizontal symmetry requires pairing every hand in *all* motifs.

(5) Subtler issues: Although there is a numerical test for the various symmetries, understanding of the geometry is still required. A "short" 2 o'clock hand and a "long" 4 o'clock hand do not constitute horizontal symmetry even though 2 and 4 o'clock satisfy the numerical test of summing to 6.

   Notation is another issue. The traditional notation for the symmetry patterns is rather complex [5]. However in the setting of a modest 2-week module exposing students to several proofs, a more familiar notation would be welcome. [8] presents a simple notation that alphabetically lists all symmetries. For example, Figure 4 is a **GHRTV** pattern indicating that it possess *horizontal, vertical, rotational, translational and glide* symmetry (Glide is defined in [5,8]).

   MIRA is an alternative richer method for teaching students geometric symmetries [11].

4. CONSTRUCTIVE PROOFS

The term *constructive proof* typically refers to a proof of existence by constructing the examples or counterexamples asserted to exist. Every constructive proof naturally lends itself to computer generated examples and games. Two examples are presented in this section illustrating this approach.

No largest number: The fact that no number is the largest number is something familiar and intuitive. This type of fact meets this paper's criteria of combining proofs with experientially familiar examples.

A person untrained in proofs may instantly recognize the fact of no largest number without being able to formulate this intuitive feeling abstractly. This corresponds to the distinctions between *visualization-rigor*(Van Hiele), *attention-transfer* (Gagne) or *sensory-motor-formal* (Piaget) discussed in the introductory section.

The proof uses the following *contradiction-reduction* method:

> Suppose there was a largest number. Let us call this number *n.* One is now challenged to produce a counterexample to the assertion that *n* is the largest number. The are many possibilities such as *n+1, 2n, n^2 etc.* Note especially that the counterexamples *2n, n^2* do not work for *n=0,* but do work for large *n.*

True to the instructional-tutorial duality introduced in an earlier section, this proof can be transformed into a tutorial game. A computer can randomly generate candidates for largest numbers to which the student must respond with a counterexample disproving the computer's conjecture. This computer game allows a student to experience the proof method before actually formally stating it.

Even in advanced mathematics, the experience of a large number of examples frequently precedes and facilitates abstract formulation.

No largest prime: This example is similar to the last example, except more sophisticated. Suppose, for example, I asserted that 7 was the largest prime. How would you go about constructing a larger prime.

You could visually inspect bigger numbers till you found a prime. But you would have to test the counterexample for primality which can be computationally non-trivial for numbers with a modest amount of digits.

The following constructive algorithm provides the needed counterexample.

> Multiply all known primes together and add one. In the case of 7, one would multiple 2 x 3 x 5 x 7 = 210 and add 1. As indicated earlier a computer game can be programmed around this construction. The game can be enhanced by providing the student with a collection of primes beneath the allegedly last prime.

One still has to prove that 210+1=211 is prime. Here, one needs an intermediate step – a lemma – that, for any integer *N*, *2N+1* has no common factor with 2, that 5N+1 has no common factor with 5, that in general *pN+1* has no common factor with *p*.

It then follows that 211 must be prime since it is not divisible by 2,3,5,7 and we assumed that these were the only primes.

Discussion: Several points follow.

(1) Counter-example subtlety: In fact 211 *is* a prime. But it need not be. The construction listed above assumed that 7 was the largest prime. That assumption and the construction create a larger number not divisible by any known prime and hence it must itself be prime *or* be divisible by some other prime greater than 7.

(2) Proof structure: One of the most challenging tasks in teaching proofs – whether to undergraduates, or graduates, whether in lecture or even in textbooks - is the concept of proof structure. Proofs, need not be, and typically are not, one line affairs. They typically, like their sisters, English essays, have several paragraphs – lemmas – developing points which are needed for the final proof. Exposing undergraduates to this crucial point is important. The example just given requires a lemma that *pX+1 and p* have no common factor.

(3) Variety: Constructive proofs have a great variety and exist in many familiar undergraduate domains such as number theory (illustrated above), geometry, group theory etc. The possibility of converting any constructive proof to a game facilitating acquiring experience, familiarity, and recognition facilitates the proof experience.

(4) Manipulatives: This paper formulates the issue of student experience from a theoretic point of view based on the pedagogic theories of Gagne, Van Hiele, and Piaget. A popular alternate formulation familiar to many instructors is to emphasize "hands-on" or "manipulatives."

5: DIVISIBILITY PROOFS

The term *divisibility proofs* refers to tests (and proofs that these tests work) on whether a given number is divisible by another number. Some well known examples of divisibility proofs are the following: a) A number is divisible by 2 if it ends in 0,2,4,6, or 8; (b) A number is divisible by 4 if its last two digits are divisible by 4; (c) a number is divisible by 8 if its last three digits are divisible 8; (d) a number is divisible by 3 (or 9) if the sum of its digits are divisible by 3 (or 9).

It is rather straightforward to restrict the domain of divisibility proofs to familiar bases thus meeting the requirements advocated in this paper: experiential familiarity that facilitates proof making. The resulting set of problems is quite rich and in fact includes other bases: For example (d) (base 100) a price can be paid with quarters if the price ends in 00,25,50 or 75; (e) (base 60) A time is divisible by 15 (quarter hours) if its last two sexagesmial digits are 15,30,45 or 00.

Computer simulation and games – another approach advocated in this paper – are also possible. A computer flashing numbers – for example, 1002, 10004, 100008, etc. – enables discovery of the divisibility test as well as the proof (See approach 2 below).

This section -- using one example, divisibility by 2 in base 10 – shows how skillful use of the pedagogic theories discussed in the introductory section allows an instructor to assess, diagnose,

and devise instructional strategies for different students.

Divisibility by 2: A base 10 number is even if it terminates with 0,2,4,6,8. The paper presents three proof methods corresponding to three Van Hiele levels.

Visualization-Analytic Approach: A student at the *visualization* or *analytic* level might prove as follows: "You can see that application of the long division algorithm (dividing by 2) to a number ending in 2 has a quotient that always terminates with 2 or 6 and has remainder 0. Similarly, you can see that application of the long division algorithm to a number ending in 4, has a quotient that always terminates with 4 or 7 and has a remainder of 0. Similar observations can be made to division by numbers ending in 6, 8 or 0."

Informal Deduction Approach: A number like 1002 is decomposable as 1002 = 10 x 100 + 2. Consequently, division by 2 results in 5 x 100 + 1. In general if $M = 10N + 2$ then $M/2 = 5N + 1$. Similar proofs can be made if the number ends in 4,6, 8 or 0.

Formal Deduction – Rigor Approach: Denote the number to be divided by 2, as *M*. Then

$$M = d_1 + 10\, d_2 + 100\, d_3 + 1000\, d_4 + \ldots + 10^{n-1} d_n$$

Implying

$$M/2 = d_1/2 + 5\, d_2 + 50 d_3 + 500 d_4 + 5 \times 10^{n-2}\, d_n.$$

Consequently, *M* is divisible by 2 if and only if d_1 is divisible by 2. Here the d_i correspond to the base 10 digit representation of the number, *M,* which is assumed to have *n* digits.

Discussion: Recall that the Van-Hiele levels do not just represent a required *sequence* of learning stages, but also represent a set of concepts and language by which the learner speaks. As pointed out earlier, according to Van Hiele, learners at different stages may not be able to communicate with each other because their concept structures are so different.

For example, it is typical at the initial visualization level, when a learner is challenged to explain why (s)he recognizes a diagram as a triangle, to respond, "Well you can see that the figure looks like a triangle."

Transferring this mode of response from geometry to number theory and applying it to the divisibility-by-2 test one expects a similar learner response: "You can see that when you divide a number ending in 2, by 2, the quotient ends in 1 or 6 and the remainder is 0." There are several points to be made about such a mathematically immature proof:

- It is better than nothing. The student has made some valid comments that directly bear on the proof.
- The student deficiency is not due to lack of skills but rather to an intrinsically deficient cognitive structure. An important implication of this is the following: asking the student to practice many examples would not immediately change the student.
- However several semesters of mathematics and proof may enable the student to advance from the initial Van-Hiele visualization stage to a higher stage where proofs are possible [14, Section VI(2)]

In other words, Van Hiele's approach distinguishes between short term skill deficiencies that can be remedied by practice and longer term cognitive deficiencies which however can also be remedied albeit by several semesters of math courses.

Similar comments can be made about the informal-deduction approach. Students at the informal-deduction Van Hiele level are typically on the border of being able to prove. Computer games are particularly useful for a guided discovery to rules. To reiterate the examples presented above, the computer generation of say 1002/=501; 10004/2=5002; 100008/=50004 enables the student to "break" the number into the last digit and 10's part (analysis) and to see the separate effects of division on each part.

In conclusion, although technically, Van Hiele's theories apply to the teaching of geometry, many authors (e.g. [14,17]) believe these concepts transfer to other domains of mathematics. This section shows that such a perspective has implications for diagnosis, remediation and instructional design. Future research in this area will undoubtedly be fruitful.

6: DEFINITION REQUIREMENT - IMPOSSIBILITY

This section presents a one-one correspondence between

- Prohibited operations
- Computer exploration
- Theorems of unpleasantness.

For purposes of specificity, this section focuses on one example, the prohibition or lack of definition of 0^0. However, the remarks above apply to many other examples such as division by 0, the value of 0/0 etc.

Prohibited operations: One cannot *prove* that 0^0 is meaningless. However, one can *motivate* why it *should* be meaningless. People often think of mathematicians as primarily proving things when in fact the specification of definition requirements is an equally important activity.

Computer exploration: Let us explore associated computer generated exploratory examples:

- The sequence 5^0, 4^0, 3^0, 2^0, 1^0 motivates that 0^0 should be 1.
- The sequence 0^5, 0^4, 0^3, 0^2, 0^1 motivates that 0^0 should be 0.
- The sequence 5^5, 4^4, 3^3, 2^2, 1^1,.$9^{.9}$, $0.8^{0.8}$, $0.7^{0.7}$, $0.6^{0.6}$, first goes down and then goes up. The downward direction suggests that 0^0 should be 0 while the terminal upward direction suggests 1.
- Computer graphics can strongly support the above argument. A visual inspection of the graph of $z = x^y$ shows the intrinsic ambiguity of unique *z*-value at the origin.

As in other examples in this paper, an instructor can transform the above exploration into a computer game where the computer presents a sequence and the student responds with the suggested definition of 0^0.

Theorems of unpleasantness: Textbooks do not ordinarily explicitly associate the above examples with a bona fide theorem. However, the computer exploration can be reformulated as a *theorem of unpleasantness: If you define 0^0 as having a particular value, then limit values of sequences cannot be unique*.

Discussion: As already indicated, very often definitions are *presented* in courses of mathematics without appropriate example exploration motivating what one *would want* the definition to look like. Each such motivation can be expressed as a *theorem of unpleasantness* motivating the requirement that the definition lack the unpleasant property.

This approach – motivating definitions - can be applied in a variety of settings, numerical and geometric. Each such setting, can be accompanied by a computer game of exploration.

Perhaps the most famous exploratory example – famous because mathematicians themselves took 150 years to straighten out amongst themselves what they wanted – is the *prohibition* of rearranging series that are not absolutely convergent. For example, the series 1 – ½ + 1/3- ¼ ….can be rearranged term by term to equal any number. Such examples – because they are numerical – can be presented before formally teaching continuity and limits. In fact, the approach of Van Hiele (and many theorists in the constructivist school) is that the examples and experience *should* have been presented prior to the definition of continuity.

7: CONCLUSION

This paper has presented a variety of concrete techniques that facilitate teaching proofs in introductory teacher preparation courses. Throughout the paper, the methods exhibited involved objects familiar to students and quick recognition methods. These familiar examples successfully expose students to several important mathematical ideas such as the geometry-number duality, the importance of counterexamples in examining conjectures, the idea of proof structure, the interrelationship between experience and proof, and computer exploration as a prerequisite to definition.

Besides the applicability of this paper to teacher preparation courses, the ideas presented in this paper have applicability in a variety of introductory courses with units studying proofs.

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Research Methodology in Marketing Publications in Turkey: Review and Evaluation

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ABSTRACT

The purpose of this study is to evaluate the marketing publications in Turkey based on their methodological issues and problems by using content analysis method. The main objective is to figure out and identify the basic problem areas in marketing publications from the methodological aspects in order to improve methodologies in marketing research. The evaluation of marketing publications is done in terms of methodological research process such as research type, research modeling, hypotheses development, sampling, measurement, data collection and data analyses.

The first study was conducted in 1995 and repeated for each year. This study provides insights and recommendations for the research methodology of marketing papers published in last five annual Turkish National Marketing Congresses' Proceedings until 2011. The main problem areas are related to modeling, hypotheses development, sampling and data analyses stages of research process. The results show that mostly popular analyses are preferred such as factor and regression analyses rather than considering suitability for research model and purpose.

Keywords: Marketing, Research Methodology, Marketing Publications, Turkish National Marketing Congresses, Content Analysis.

1. INTRODUCTION

The objective of this study is to review and evaluate the marketing publications to determine basic methodological problems in marketing research in terms of methodological framework in Turkey.

The discussion of research methodology used in marketing publications has been going on for last years [1] [2] [3]. The results of reviews and evaluations are different during this time of period. Mostly problem area is analyses, sometimes weak modeling.

For this study, 214 marketing papers published in last five annual Turkish National Marketing Congresses' Proceedings until 2011 which consisted of 12th [4], 13th [5] [6], 14th [7] and the 15th Turkish National Marketing Congresses [8] are examined to evaluate the publications and their research methodology. Content analysis is used as the research technique for understanding, determining and analyzing the development of the marketing discipline through evaluating these publications.

Kurtuluş and Dündar [1] evaluated 41 papers, Kurtuluş and Kurtuluş [3] evaluated 236 marketing publications by using similar methodological criteria, that is a basic research process in marketing area [9] such as content categories, research type, research modeling, research hypotheses, sampling, measurement, data collection and data analyses.

The main objective of this study is to analyze the marketing publications in Turkey according to their research type, modeling, hypotheses, sampling, measurement, data collection and analyses to find out basic methodological problems and how it's changed from years.

2. CONTENT CATEGORIES

There are 214 papers published for National Marketing Congresses's Proceedings between 2007 and 2011 examined. Their content categories can be broadly classified into consumer behavior, retailing, marketing management, tourism management, product and brand management, marketing strategies, international marketing, logistics management, marketing ethics, marketing communication, social marketing, services marketing, sales management and marketing research. The study indicates that consumer behavior, marketing management and retailing are the main categories of 214 marketing publications examined. One of the recent studies conducted in Turkey is also verified that consumer behavior is the most preferred subject for research by Turkish academicians [10]. Retailing was the fourth main area last year [11] although

it's third this year. The number of marketing publications by content categories is shown in Table 1.

Table 1: Number of Publications by Content Categories

Content Categories	Number	Frequency (%)
Consumer Behavior	73	34.1
Marketing Management	28	13.1
Retailing	23	10.7
Tourism Management	20	9.3
International Marketing	14	6.5
Marketing Communication	10	4.7
Services Marketing	8	3.7
Logistics Management	7	3.3
Marketing Research	7	3.3
Product and Brand Management	6	2.8
Marketing Strategies	6	2.8
Social Marketing	5	2.3
Marketing Ethics	4	1.9
Sales Management	3	1.4
Total	214	100.0

3. RESEARCH TYPE

Proceedings are coded according to their research type, whether the paper is theoretical or involves research; quantitative research or qualitative research or mixed.

Table 2 shows that the number of research based marketing publications is higher than the number of theory based ones, same as last year publications. In theoretical papers, there is no significant contribution to the existing literature, only the current literature analysis and adaptation is made. In addition, there is also some confusion in theoretical concepts translated from the foreign literature.

Table 2: Research versus Theory Based Papers

	Number	Frequency (%)
Research based	172	80.4
Theory based	42	19.6
Total	214	100.0

At the same time research based papers include both quantitative and qualitative research (see Table 3). Table 3 shows the research types namely quantitative research and qualitative research. Clearly, quantitative research dominates qualitative research in numbers. Although there is an increase in the number of qualitative research papers compared to previous years [1] [3] even last year [11], it is not adequate for marketing academia. Hanson and Grimmer [12] focused on analyzing the mix of qualitative and quantitative research published in major marketing journals from 1993 to 2002. It was found that overwhelming amount of research articles in marketing academia were quantitative similar to our study. This result can be interpreted that doing qualitative research seemed to be not preferred by most of marketing academicians. Personal preferences of researchers and not having required expertise related to qualitative research may be the reasons of this situation.

Table 3: Quantitative versus Qualitative Research

	Number	Frequency (%)
Quantitative Research	146	84.9
Qualitative Research	26	15.1
Total	172	100.0

4. RESEARCH MODELING AND HYPOTHESES

Out of 172 marketing publications examined, 46.5 % of those used descriptive-predictive model, 32.6 % used causal model and finally only 20.9 % used exploratory model. There is significant amount of improvement for exploratory and causal models when we compare last year results [11]. Research models used in these publications are presented in Table 4.

Table 4: Research Models

	Number	Frequency (%)
Exploratory Model	36	20.9
Descriptive - Predictive Model	80	46.5
Causal Model	56	32.6
Total	172	100.0

In some of the studies, there is no specific research design based on the research purposes, showing the variables sets and their relations. Approximately, 40.7 % of marketing publications has appropriate research designs although it is not sufficient yet. This result shows that there is a considerable increase in research design usage compared to the previous research results [1]. On the other hand 34.3 % of marketing publications did not use research designs. It is also observed that there is no design in about 25 % of papers which are mostly soft and exploratory researches.

Table 5: Specific Research Design Usage

	Number	Frequency (%)
Design used	70	40.7
No design used	59	34.3
No design used although must be used	43	25.0
Total	172	100.0

In 45.9 % of the studies, researchers have developed research hypotheses and tested these hypotheses. But, hypotheses are not formulated in some studies having descriptive-predictive and causal models. Unfortunately, in some studies hypotheses are developed incorrectly (null hypotheses versus alternative hypotheses) and these wrong hypotheses are also tested.

Table 6: Hypotheses Usage

	Number	Frequency (%)
Hypotheses developed	79	45.9
No hypotheses developed	70	40.7
No hypotheses developed but must be	23	13.4
Total	172	100.0

5. SAMPLING AND MEASUREMENT

Sampling is an important step in the research process because it is one of the indicators of the quality of inferences made by the researcher that stem from underlying findings [13]. Researchers must decide the number of participants for selection and how to select these sampling units in their studies. Thus, sampling process in these studies is evaluated in terms of sampling method and sample size.

Table 7: Sampling Methods

	Number	Frequency (%)
Convenience Sampling	155	91.7
Systematic Sampling	6	3.6
Cluster Sampling	3	1.8
Simple Random Sampling	2	1.2
Snowball Sampling	2	1.2
Judgmental Sampling	1	0.6
Total	169	100.0

Convenience sampling is the most widely used sampling method whereas systematic sampling, simple random sampling and cluster sampling are also used rarely in marketing publications. Besides, census is used in three of 172 research based studies instead of sampling. In the study of Kolbe and Burnett [14], a content analysis research, the majority of samples used are also classified as convenience samples. On the other hand, systematic sampling are found more frequently among other probability samples such as proportionate, simple random and stratified sampling in their study. Although snowball and judgmental sampling methods were not used in the past, only three studies have these sampling this year [11].

In these studies, mostly small samples are used in qualitative researches and large samples are used in quantitative researches. Indeed, there are times when it is appropriate to use small samples in quantitative research, while there are occasions when it is justified to use large samples in qualitative research [13].

Table 8: Sample Sizes

	Number	Frequency (%)
200 or less	62	36.0
201 - 400	54	31.4
401 - 600	32	18.6
601 - 800	10	5.8
801- 1000	8	4.7
1001 or more	6	3.5
Total	172	100.0

According to research findings, the sample sizes are not calculated in the majority of the marketing publications. The sample size is determined by researchers arbitrarily. In most of the publications, sample sizes are less than 200 respondents or between 201 - 400 and 401 - 600 respondents as shown in Table 8.

Measurement is important in accurately representing the concept of interest and is instrumental in the selection of the appropriate method of analysis. There are two types of scales that are non-metric measurement scales and metric measurement scales. Nonmetric measurements can be made by nominal and ordinal scale whereas metric measurements can be made by interval and ratio scales [15]. Nominal scales are the simplest to use, and the ratio scales are the most complex [16].

Based on our study, the most widely used scale is the Likert Scale. Semantic differential is the other alternative attitude scale that is used in most of the marketing papers. According to Kumar [17], attitude scales will become more widely used in research as consumers become more educated and experienced in responding to marketing research questions.

6. DATA COLLECTION AND DATA ANALYSES

In terms of data collection, questionnaires are mostly used in quantitative researches whereas focus groups are mostly used in qualitative researches. In addition, the researchers preferred face-to-face interviews, scenario and simulation techniques in order to collect the data. As well as face to face interview, mail surveys and internet surveys have been frequently used as data collection instruments nowadays. Internet is a powerful tool for marketing researchers which offers many opportunities [18]. The purpose of data analyses is to obtain meaning from the collected data [19]. The important issue in data analyses is the determination of appropriate statistical procedure. Scale of measurement, the research design and the assumptions underlying the test statistic all affect the choice of a statistical method.

Table 9: Data Analyses

	Number	Frequency (%)
Factor Analysis	55	19.6
Reliability - Validity Tests	44	15.7
Regression Analysis	35	12.5
ANOVA - MANOVA	33	11.7
Chi-Square Test	26	9.3
Correlation Analysis	23	8.2
T test	23	8.2
Structural Equation Modeling	19	6.8
Discriminant Analysis	6	2.1
Content Analysis	6	2.1
Cluster Analysis	5	1.8
Kruskal-Wallis	2	0.7
AHP	2	0.7
Meta Analysis	1	0.4
Multidimensional Scaling	1	0.4
Total	281	100.0

The papers are evaluated in terms of the analyses' choice and their appropriate usage in our study. Number of analyses used in marketing publications can be seen in Table 9 above.

Table 9 shows that the number of factor analysis, reliability and validity tests, regression analysis, Anova, correlation analysis and chi-square test usage is higher among other analyses. In addition, the analyses such as t test, structural equation modeling is also taken an important share in data analyses. Cluster analysis, discriminant analysis, Kruskal-Wallis test,

AHP, Meta analysis and multidimensional scaling are also used by marketing researchers.

The results of in-depth content analysis indicate that in large number of studies, popular analyses are applied rather than appropriate ones. Reliability and validity tests, factor and regression analyses seemed to be popular patterns for Turkish marketing academicians. In some of the studies, the reliability of scales is lower than the generally agreed upon lower limit for Cronbach's Alpha, 70 % [15].

Another problem is related with inappropriate or insufficient statistical analyses usage. One of the examples of this wrong usage is using t test, testing the differences between the mean values of two groups, instead of Anova, testing the differences between the mean values of more than two groups [20]. Another example is not using non-parametric analyses where they are appropriate.

There are also some serious problems in using factor, regression and discriminant analyses such as improper naming of factors, problems in selecting the right method of regression analysis and in applying Morrison test in discriminant analysis.

7. CONCLUSION

In summary, there are some basic problems and weaknesses in marketing publications in Turkey despite a positive trend in the improvement of the methodology of latest publications compared to previous years.

Although there is an improvement, the problems mostly occurred in the modeling, hypotheses development, sampling and data analyses stages of research process. The results indicate that there are some weaknesses in the methodological process used by researchers in conducting qualitative research, developing research design and hypotheses.

Problems with sampling method selection also exist. Mostly, convenience sampling is chosen by researchers either because of time or budget constraints.

The findings demonstrate that attitude scales especially Likert scales are mostly preferred by researchers as it is expected. In terms of data collection methods, questionnaires are dominant among others.

It is interesting that all periods had some popular patterns of data analyses. However, it is suggested that data analyses must be selected in terms of research purposes, research design, scales of measurement and the assumptions underlying the test statistics.

It is important to note that the results of the current study are limited to the research processes of marketing publications reported. Although only the marketing papers published in last five annual Turkish Marketing Congresses' Proceedings are chosen as basis of this study, it is hoped that this study will provide a basis for further improvements in terms of research methodology in the field of marketing.

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Towards a formulation of a comprehensive risk model for an integrated supply chain: Development of risk interaction and structure constructs

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ABSTRACT

Increasing economic uncertainty, demand instability, and supply interruption from natural and man-made disasters have intensified the frequency and magnitude of supply chain failures. A rigorous analysis and assessment of risk can be difficult to accomplish, however, because of complexities resulting from structure and interaction among supply chain elements. In this research, we contribute to the development of a comprehensive model of risk that considers the vulnerability associated with individual risk elements, along with the structure of the supply chain network, and the risk interactions which may intensify or attenuate individual risk levels.

Keywords: Supply Chain Security, Risk Analysis, Supply Chain Management

INTRODUCTION

Managers have long struggled with the challenges of uncertain events that lead to poor performance in the supply chain. Some of these risk events are routine as late or short shipments from a supplier; others provide major disruptions as in the case of devastating earthquakes that interrupt supply for months or years.

The precepts of risk management are especially pertinent and helpful in this context. Risk is commonly defined as an uncertain or chance event that planning cannot overcome or control. Managers of course are most concerned about risk events that lead to negative outcomes; the risk management process provides a proactive approach that recognizes and manages risks that would impact an organization's success. The risk management process begins with the identification of the possible risk events, followed by risk assessment and analysis where the impact and likelihood of each event is quantified. It is important to determine an appropriate risk response for major risk events which may involve mitigating risk, or transferring or sharing it with a supplier or outside agency. A final step is risk response control, as the risk environment needs to be monitored and updated over the timeframe of the operation.

These principles of risk management readily apply to supply chain management. Indeed, a good deal of research pertaining to the application of risk management to the supply chain has been published over the last decade. A seminal article by Tang [1] defines supply chain risk management (SCRM) as "the management of supply chain risks through coordination or collaboration among the supply chain partners so as to ensure profitability and continuity." Other influential works include Chopra and Sodhi [2] who provide a categorization of risks, and Kleindorfer and Saad [3] who focus on disruption risks. Literature reviews on supply chain risk management include Zsidisin, Ellram, Carter and Cavinato [4]; Rao and Goldsby [5]; and Ritchie and Brindley [6]. There is also a great deal of literature concerning the focused topic of security, nicely summarized in Gould , Macharis and Haasis [7]; and Williams, Lueg and LeMay [8].

This research contributes to this literature by developing a framework for measuring supply chain risk when individual effects, structural effects, and interaction effects are considered. The potential of this approach is demonstrated with an example that includes elements commonly seen in supply chains.

PROBLEM DESCRIPTION

Risk in any organization can be viewed as two-dimensional, i..e. the likelihood of the event occurring, and the impact on the organization if it does occur. Tang [1] provides a classification scheme for the impact dimension, using the term *disruption* to refer to those risks that caused by natural and man-

made disasters such as earthquakes, hurricanes, floods, economic crises, strikes and terrorist attacks. Chopra and Sodhi [2] view risk categories in terms of drivers, and add supplier bankruptcy and single source dependency as additional causes of disruption risk. On the other hand, the term *operational* refers to everyday risks that are driven by uncertainties in demand, supply and cost. Chopra and Sodhi [2] expand on this list by including material delays (e.g. inflexibility and poor quality), information system breakdown, inaccurate forecasts, IP violations (driven by vertical integration and global outsourcing), procurement (e.g. exchange rates), receivables exposure (e.g. bankrupt customers), inventory and capacity mismatches. Much of this operational risk originates naturally as a result of the day-to-day routine that involves the production and delivery of product. There are numerous such elemental, individual risks in a typical supply chain. Thus, we consider two types of risk in this research: operational risk (Type I) and disruption risk (Type II).

The risk likelihood dimension, however, is less well understood. We propose here that the likelihood of a risk occurring may be framed and modeled using three constituents: individual risk element, risk interaction, and supply chain structure. The elemental level consists of the risk events (e.g. late material shipments, labor strikes) to which individual members of a supply chain (e.g. suppliers, carriers, ports) are exposed. These risk elements may be either operational (Type II) or disruption related (Type II). A method for assessing likelihood is frequency analysis, which is useful when an event occurs often enough to provide a reliable estimation. Frequency analysis is not helpful, however, for events that happen infrequently as with many disruptive risks. Later we propose using a systematic benchmarking approach with a focus on best practice in risk mitigation.

The second constituent on supply chain risk likelihood is due to interaction effects between the individual risks, as risk level may be modified through the relationship of elements with other elements of the supply chain. For example, when a trusted, low-risk carrier ships goods from a less well-known and riskier supplier, the trust afforded to the carrier reduces the combination risk of the carrier and supplier together. These interactions are also useful when evaluating the network effect in tightly linked supply chains, as is the case when firms develop partnerships to integrate supply chain processes. Firms in a supply chain are exposed to the risks faced by their suppliers and carriers; for example, a weather-related event that shuts down a supplier quickly shuts down its closely-integrated customer. Both Type I and Type II risks can be influenced by interaction effects in this way.

Finally, the structure provided by the supply chain's design will also affect the overall risk, as individual components of risk will either be increased or decreased depending on the circumstances. A case example for this structural modification of risk may be made when multiple suppliers or parallel carriers are utilized, or when alternative routings are used for international shipments that involve different ports. Again, both Type I and Type II risks can be influenced by structural effects in this way.

Within this framework, we define the research question guiding this effort as follows: how can the overall risk in a supply chain be assessed given (1) the existence of multiple types of risks (i.e. operational and disruption), and (2) the existence of numerous risk elements that interact and (3) the influence of supply chain structure that may increase or decrease these effects.

MODEL CONSTRUCTS

Supply Chain Risk Elements

In this section we discuss risk that occurs at the level of the individual element for a supply chain member, and discuss a method for assessing risk that considers only these individual elements. Earlier research has proposed methods for computing risk-related scores for suppliers, carriers and ports using benchmarks in the security arena [9-11]. We extend these methods here to consider both operational and disruptive risks throughout a supply chain.

One type of risk that has received a great deal of attention in the research literature is security related risk in the supply chain. These types of risks are especially difficult to assess, as a frequency-based approach is generally not viable. Security related practices at an organization may, however, be observed and compared to industry best practice as a way to determine how much risk is introduced by a particular supply chain member. This scheme may be operationalized by scoring an organization based on the degree to which these best practices are followed, using the International Ship and Port Facility Security (ISPS) code [11, 12]; the Supply Chain Security Orientation (SCSO) [13]; or industry-based best practices [9, 10, 14]. Closs and MacGarrell [10] and Bichou [11] provide a system of best practices for use in computing scores. For example, a carrier that has poor hiring practices poses a greater security risk to their operation than a carrier that performs both pre-hiring and post-employment background checks on its employees Similarly, a supplier that hasn't thought through the impact of key suppliers on their operation poses a greater risk than a supplier that has

identified alternative material sources in the case of a supply chain disruption.

Meixell and Norbis [9] develop a methodology for computing an overall assurance score in the security risk context, based on achievement of a minimally acceptable performance level for each indicator in thematic areas, for each supply chain member. The term "assurance" is used here to reflect the confidence one would have in an organization that adopts good practices in risk management. In security, for example, suppliers may be evaluated based on their observance of best practices in each of three themes: relationships, security efforts, and incident security management. Similarly, suppliers may be evaluated based on their likelihood in other categories as well, including those related to demand and supply uncertainties. This same approach is also readily applicable to other supply chain members including carriers and ports. Here, the individual risk score is calculated following the conventional approach that defines risk as the chance in quantifiable terms of an adverse occurrence [15] for each type as:

Risk Score Type I = 1-Assurance Score Type I [1]

Risk Score Type II = 1-Assurance Score Type II [2]

Individual risks may then be defined as:

sr_i Individual Type I risk for supplier i
$s\rho_i$ Individual Type II risk for supplier i
cr_j Individual Type I risk for carrier j
$c\rho_j$ Individual Type II risk for carrier j
pr_k Individual Type I risk for port k
$p\rho_k$ Individual Type II risk for port k

They are summarized in Table 1.

Table 1 Parameters for individual risk

	Suppliers	Carriers	Ports
Type I risk	sr_i	cr_j	pr_k
Type II risk	$s\rho_i$	$c\rho_i$	$p\rho_k$

As an example, consider a hypothetical case comparing the risk associated with 2 suppliers, 2 carriers and 2 ports. For these six possible supply chain members, individual assurance scores may be evaluated and individual risk scores calculated according to [1] and [2]. They are:

$sr_1 = .2$ $sr_2 = .1$
$s\rho_1 = .0001$ $s\rho_2 = .01$

$cr_1 = .1$ $cr_2 = .2$
$c\rho_1 = .02$ $c\rho_2 = .002$

$pr_1 = .5$ $pr_2 = .2$
$p\rho_1 = .001$ $p\rho_2 = .02$

These individual values may then be used as such to evaluate the risk that an individual member presents in a supply chain, perhaps useful in the supplier selection or development process. Their scores may also be combined to evaluate risks due to direct interactions and supply chain design, as we describe in the following sections.

Supply Chain Direct Interactions

Another influence on supply chain risk is the interaction effect between individual risk elements, as risk levels associated with individual supply chain members may be modified through supply chain relationships and their interactions. The risk score may be altered when information is shared between members, or when decisions are integrated to improve overall supply chain performance. For example, assurance may be improved when supply chain members collaborate [13, 16, 17] by sharing timely and valid information, by using RFID for tracking purposes, and by maintaining a high level of security in their own information systems [14].

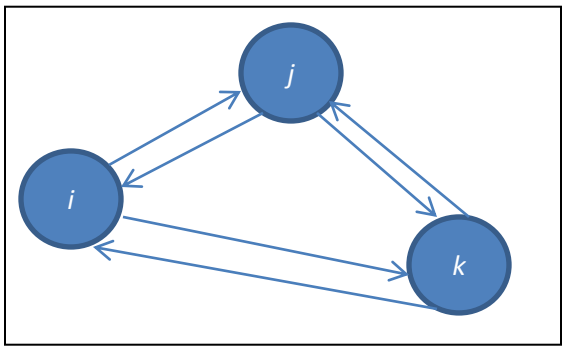
In this paper, we allow for this type of collaborative improvement to be factored into risk assessment, and call it direct interaction to differentiate it from the general interaction to which every member of the supply chain is subject to. We then develop rules to combine risk when one or more supply chain members interact directly. Finally, we propose a methodology to quantify the combined risk score, and illustrate it with a small case.

As partners of the supply chain communicate in an exchange of material, information and money, risk is passed along in the exchange in such a way that the risk of the combined members, in general, differs from the individual contributions to risk. In the proposed model, each member of the supply chain is characterized for each risk type by a risk score in the 0-1 scale where 0 represents a risk-free state and 1 represents the highest risk.

Following Wagner and Neshat [18], we propose a graphical model to represent these relationships and interactions. In this graphical model each member of the supply chain is represented by a node, and the connections between members are represented by directed arcs which represent in the authors' view, the main direction of the flow of risk. The graph in Figure 1 is such a schematic representation of a simple supply chain including three members, i, j and k. Supply chain members are represented by nodes and, as they interact, the risk that is passed through the interaction is represented by the directed arcs. For example risk of late deliveries and poor quality product flows in the same direction that the product does, while risk of wrong information may flow in both directions along the whole supply chain. On the

other hand Type II risk of disruption affects every member in the supply chain in contact with the product or the information. To evaluate the combined risk score for the unit constituted by two or more members in the supply chain we propose to combine the individual risk and the level of interaction under three rules.

Figure 1 Graphical representation of supply chain members and their risk interactions.



The first rule is *neutral interaction*. When the interaction between members in a supply has no effect on assurance, the risk factor for the combined unit equals the rating of the member with the highest risk factor. In other words, the weakest member drives the supply chain risk.

The second rule applies when there is *positive interaction* between the members in the supply chain. Here, interaction improves the assurance associated with the riskiest member. If one supply chain member is associated with another member with higher assurance due to better practices, then the overall risk for the unit equals the score for the member with the lowest risk.

The third applies when there is *negative interaction* between the members in the supply chain. Even if uncommon, it can be thought of a situation in which the interaction of two members would increase the overall risk of the supply chain beyond that posed individually by each member. In this case the highest risk will be multiply by a factor greater than 1. This could be the case, for example, of a carrier visiting a port of another nation in the proximity of war with the carrier's country of origin.

These interactive risks will be represented by r_{ijk} and ρ_{ijk} where:

r_{ijk} : Type I risk incurred by the direct interaction of member *i* with members *j* and *k*.

ρ_{ijk} : Type II risk incurred by the direct interaction of member *i* with members *j* and *k*.

The risk scores are calculated as functions of the individual risks which are derived from the previous rules and will be generically represented as:

$$r_{ijk} = f\ (sr_i, cr_j, pr_k)$$

$$\rho_{ijk} = \varphi\ (s\rho_i, c\rho_j, p\rho_k)$$

Following with the example, let's assume that because supplier 2 developed a partnership with carrier 2 and both operate out of port 2, then the r_{222} and ρ_{222} becomes the lower of the 3 risks in each type

$$r_{222} = \min\{ sr_2, cr_2, pr_2\} = \min\{.1, .2, .2\} = .1$$

$$\rho_{222} = \min\{s\rho_2, c\rho_2, p\rho_2\} = \min\{0.01, 0.002, 0.02\} = 0.002$$

Now if we assume that between supplier 1, carrier 1 and port 1 there is no interaction that affects their operational or disruption assurance, the first rule of neutral interaction applies and the unit risk equals the highest risk of its members:

$$r_{111} = \max\{ sr_1, cr_1, pr_1\} = \max\{.2, .1, .5\} = .5$$

$$\rho_{111} = \max\{s\rho_1, c\rho_1, p\rho_1\} = \max\{0.0001, 0.02, 0.001\} = 0.02$$

Supply Chain Structural Design

It is common practice in supply chain management to use supply chain structure to reduce risk. This is an example of using the structure of the supply chain to reduce risk. In this section, we generalize this practice to consider a variety of sub-structures, and then propose a method for incorporating structure in risk assessment.

It is possible to duplicate any of the elements in the supply chain, for example dual sourcing (applies equally to dual carrier or dual port) and it can be duplicated either in series as in parallel. The Type I risk for elements in series follows the addition rule of probability [19]. The Type II risk for elements in series is calculated as the maximum of the individual risks because it is assumed that as the disruption occurs, it stops all processes in the supply chain [20].

For elements in parallel, for the Type I risk, the multiplication rule of probability for independent events applies [19]. While for Type II risk, again it is assumed that when the disruption occurs it stops all processes and so the risk will equal the maximum of the risks.

Table 2. Type I and Type II risk for dual members in series and in parallel

	Series	Parallel
Type I risk	$sr_1 + sr_2 - sr_1 * sr_2$ (3)	$sr_1 * sr_2$ (4)
Type II risk	$max\ (s\rho_1\ ,\ s\rho_2)$ (5)	$max\ (s\rho_1\ ,\ s\rho_2)$ (6)

The previous argument applies equally to carriers and ports. The corresponding equations can be equally derivate.

Another structural situation is associated with the carrier's route. When a given carrier makes stops at multiple ports the risks associated with these ports are passed on to the carrier and they are modeled as described here. We assume that:

1. The cargo proceeding from original supplier is not altered at the new carrier stop.
2. No new cargo for this demand is loaded at any of these stops, because to do so will constitute multiple suppliers which is addressed in a separate part of this section.

Under these assumptions, the original cargo is subject to the risk of delays (Type I) associated with additional port(s) as well as with additional supplier(s) that even when not supplying our demand they incur in delays in the route. They are also subject to the risk of disruption because of catastrophic events associated with additional suppliers, ports or routes (Type II). It seems intuitive that the addition of elements in the supply chain would not decrease Type II risk. The risk involved in these situations was previously addressed in equations 3, 4, 5 and 6 as multiple suppliers and multiple ports in series.

Continuing with the example we are considering the two available suppliers for a dual sourcing in series and in parallel. The Type I and Type II risks scores are calculated following equations in Table 2 and the results are shown in Table 3.

Table 3. Type I and Type II risk for dual members in series and in parallel, example.

Supplier	Series	Parallel
Type I risk	.2 + .1 - .02= .28	.2*.1=.02
Type II risk	.01	.01

CONCLUSIONS AND NEXT STEPS

In this research, we present a framework to address the comprehensive nature of risk in the supply chain. In particular two different settings that influence the analysis of risk have been recognized and analyzed. The first consists in the separation of operational risk from disruption risk The other situation consist in the separation of individual risk inherently associated with an element independent of its relationships and the supply chain risk as a product of the interactions of element in the supply chain as well as the supply chain structural design.

An observation can be drawn from this analysis, that the duplication of sources (same as that of carriers or ports) recognized by some authors [20] [21] [22] as a method to minimize risk, actually minimizes operational risk but may increase disruption risks. The more members in a chain the more opportunities for disruption to occur and perhaps the less resilient the supply chain becomes.

The next step in this research effort should consist in the formulation of a mathematical model that incorporating these measures of risk will make design recommendations to minimize risk in the supply chain.

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COMMUNICATIVE PRAXIS IN THE AGE OF GLOBALIZATION

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ABSTRACT

This paper builds on Brouthers' [5] work by adding within-culture communication styles to the cultural context determinant in his model of three determinants of entry mode selection. In this way, **cultural context** may be broadened to include within-culture communication style and measured, as this paper suggests, by employing the LMR [Linear-active, Multi-active, and Reactive] framework using Cultureactive or ICE.

The contribution of this paper is the linkage to Brouthers' celebrated work and the proposition that cultural context may benefit from including a cultural context lens, such as the LMR framework.

The hypothesis of this paper is whether Entry Mode and mode performance are more predictable when LMR classifications between home and host market actors are more similar than different.

The Literature Review links the concepts of *Praxis*, Brouthers' [5] landmark work, ICE [InterCultural Edge] and the Business Context/Survey Language model used in the InterCultural Edge (ICE) Research Progress Report.
http://faculty.fuqua.duke.edu/ciber/ice/about.html
Accessed March 2, 2012

In conclusion, this paper suggests integrating the LMR framework with Brouthers' [5] scholarly work to better explain cultural context and provides a communication Praxis approach to an important globalization decision, i.e. mode of entry.

Keywords: Praxis, Globalization, International Business, Culture, Strategic Management, Communication, Leadership, Decision-making

LITERATURE REVIEW

The origins of the word *praxis*:

*In Ancient Greek the word **praxis** (πρᾶξις) referred to activity engaged in by free men. Aristotle held that there were three basic activities of man: theoria, poiesis and praxis. There corresponded to these kinds of activity three types of knowledge: theoretical, to which the end goal was truth; poietical, to which the end goal was production; and practical, to which the end goal was action. Aristotle further divided practical knowledge into ethics, economics and politics. He also distinguished between **eupraxia** (good praxis) and **dyspraxia** (bad praxis, misfortune).*
http://en.wikipedia.org/wiki/Praxis (process)
Accessed February 29, 2012

This paper focuses only on *eupraxia*, i.e. good praxis, and links it pivotally to communication, which as the continental philosopher Calvin O. Schrag [18] notes, *should always be entwined with communication.*

Morever, this paper was inspired by the winner of the 2012 *JIBS* Decade Award for his 2002 article **"Institutional, Cultural and Transaction Cost Influences on Entry Mode Choice and Performance"**, where **Professor Keith Brouthers** [5] was recognized for his influential, innovative and impactful work published in *JIBS* ten years ago.

This seminal piece underscores entry mode selection as modified by three overarching variables: **Transaction cost** (identification

of potential partners, negotiation and monitoring costs), **Institutional context** (legal restrictions on foreign ownership), and **Cultural context** variables (market potential; investment risk). These two cultural context variables examine: (1) profit conversion/ repatriation risks, (2) nationalization risks, (3) cultural similarity, (4) political, social, and economic conditions.

The *praxis* of communication dictates that **cultural context** include not only **profit potential** (measured by a Likert-type question focused on the target market's profit potential) and **investment risk** (measured by four Likert-type questions assessing the need for location-specific knowledge coupled with the need for resource commitment minimization), but also a variable capturing within-culture communication styles. Cultural similarity across profit potential and investment risk is clearly important. Moreover, given the age of globalization, a value-added variable for cultural context may be cross-cultural communication, as measured by the LMR [Linear-active, Multi-active, and Reactive] framework.

Brouthers [5] employed two dependent variables: **entry mode**, captured by wholly-owned subsidiaries vs. joint ventures; and **mode performance**, measured by subjective data (management performance evaluations when objective measures were unavailable). He found that when entry mode was predicted by the transaction cost model, firms performed better than firms whose entry mode choice could not be predicted by this model. The selection process was a function of transaction cost characteristics, legal restrictions and investment risk.

Cultural context was added to transaction cost entry mode considerations by Brouthers [5] as target market managerial costs and uncertainty evaluations are impacted by these variables. With the exponential growth of globalization and implicitly, entry mode, the praxis of a value-added criterion for cultural context, as argued in this paper, may be the LMR framework, as measured with Cultureactive or ICE [InterCultural Edge]. The hypothesis would then be:

Entry Mode and mode performance are more predictable when the LMR classifications between home and host market actors are more similar than different.

ICE PROVENANCE

ICE emerged from another cross-cultural assessment tool, Cultureactive when from a research perspective, validity and reliability issues became increasingly paramount. Grounded in his forty-plus years of cross-cultural consulting, Richard Lewis, who authored *When Cultures Collide* [14] and *The Cultural Imperative* [15], was challenged to explain national, international and transnational business cultures. Poignantly, he conceived the LMR framework, which gave birth to Cultureactive and later ICE.

The 1980s propelled an acute demand for cross-cultural instruction, and Richard Lewis, the consultant, was approached repeatedly by multi-national clients for a new and practical cultural/national classification system. For years, cross-culturalists had grappled with the problem of summarizing or simplifying national characteristics. Richard Lewis proposed that cultures could be classified simply and more comprehensively according to the three categories, comprising the LMR framework [14] & [15].

Linear-actives

Cultures which are task-oriented, plan, organize, schedule and pursue one thing at a time (e.g. Germans, Swiss).

Multi-actives
Cultures which are lively, loquacious, multitask, prioritize according to the importance or thrill of the event (e.g. Italians, Latin Americans, and Arabs).

Reactives
Cultures that prioritize courtesy and respect, listen quietly, and react carefully to proposals (e.g. Chinese, Japanese and Finns).

The strength of this framework is that it transcends previous works by focusing on the individual, rather than the nation-state as the unit of analysis. With no assumption of within-country homogeneity, the above hypothesis focuses on actors rather than nations. The focus of the LMR model is communication, which is often the impediment between and among cultures, and commensurately a key consideration in globalization and mode of entry considerations.

Known as the ABC research team, Adair, Buchan and Chen [1] & [2] capitalized upon both Hall's [9] low context/high context communication tool and Triandis' [21] model of subjective culture to result in the theoretical underpinnings for ICE. The conceptual reconfiguration also leveraged the works of Trompenaars [22], Holtgraves [12], Hampden-Turner [22], Thomas and Kilman [19], Yamagishi [24], and Bearden, Money and Nevins [3] in the evolution from the experientially-based Cultureactive to the theoretically-based ICE.

The contribution of this paper is the linkage to a celebrated work and the proposition that cultural context may benefit from including a within-culture communication lens at the micro level, such as the LMR framework. Commensurate with exploring, expanding and energizing international education and globalization, such cross-cultural assessment tools equip academicians and practitioners with communicative praxis and cross-cultural capital. Prior theoretical frameworks for studying cultural differences have included the Kluckhohn-Strodtbeck [10], Trompenaars and Hampden-Turner [22], and most notably, Hofstede [11].

The provenance of Cultureactive and ICE are chronicled in more detail in an earlier paper [23]. ICE is a collaborative initiative between the Fuqua School of Business, Duke CIBER, Richard Lewis Communications, and Cultureactive.com. Cultureactive and ICE are web-based products that teach cross-cultural awareness in business settings by focusing on individual cultural profiles which are then compared to national profiles using the LMR constructs. Participants may analyze personal assessments, team results and national cultural profiles. Research consortia have recently completed the requisite validity and reliability measures for ICE, and commensurate ICE teaching consortia are establishing a certified teaching network.

Capitalizing on the LMR framework, the cross-continent implementation of Cultureactive had elicited a fundamental question of whether one's business affinity or cultural mindset has a more direct effect on individual cultural profiles and leadership/communication/cultural style. The samples for this work [23] came from several multi-cultural sources: European Fulbright students, Sub-Saharan African entrepreneurs, Duke University and Georgia State University MBA and undergraduate business students. It was demonstrated that the universal dichotomy across cultures and between disciplines, as measured by the business vs. non-business variable, is a more powerful

indicator of work habits, negotiating styles, cognitive processes, communication style, etc., than is cultural orientation.

The second pivotal question to emerge was whether *Survey Language* mattered. Are leadership/communication/cultural frameworks different for participants primed in English vs. their native language? Cross-national studies examined the following two variables and four conditions for cross-cultural similarities and differences:

Business Context

Survey Language	Yes	No
English		
Native Language		

Source: InterCultural Edge (ICE) Research Progress Report
http://faculty.fuqua.duke.edu/ciber/ice/about.html
Accessed March 2, 2012

LMR COMMUNICATION PRAXIS APPROACH FOR MODE of ENTRY GLOBALIZATION DECISION

An earlier study [23] established dominant within-professional similarities and few cross-cultural differences, resulting in a powerful leadership/communication/cultural framework. These distinct paradigms for business vs. non-business models are further substantiated by trends emerging in other works. As business vs. non-business predisposition has a more direct impact on one's individual cultural profile than does nationality, the assertion made in this paper is that by broadening the cultural context variable as discussed by Brouthers [5] to include the LMR framework, as assessed by Cultureactive or ICE, this will better capture and predict the mode of entry globalization decision.

Further, as the LMR framework may serve as an enhanced proxy for cultural context, the second question to emerge from previous works [23] may also be a consideration. Thus, mode of entry decisions made in English or in one's native language may result in different outcomes.

In conclusion, this paper has suggested the application of the LMR framework to Brouthers' paradigm to more robustly explain cultural context and in so doing, provides a communication Praxis approach to an important globalization decision, i.e. mode of entry.

CONCLUSION

This paper has proposed adding within-culture communication styles to the cultural context determinant in Brouthers' [5] model of three entry mode determinants. In this way, **cultural context** may be broadened by employing the LMR framework to measure within-culture communication style. The following hypothesis could then be researched:

Entry Mode and mode performance are more predictable when the LMR classifications between home and host market actors are more similar than different.

By facilitating the classification of cross-cultural communication styles, the LMR framework may enrich the cultural context

component of the globalization decision. Specifically entry mode and resulting mode performance would be enhanced through the LMR lens, which would serve as the **communicative praxis in the age of globalization.**

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Improving the infrastructure to establish e-government project in Developing Countries with alternative solution: First Steps from Libya

The 6th International Multi-Conference on Society, Cybernetics and Informatics (IMSCI 2012), July 17th - 20th, 2012 – Orlando, Florida, USA

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ABSTRACT

In developing countries, people are not aware of technologies and the worst case when we talk about Internet technology. Thus, any plan from the government to communicate with the public using it is bound to face difficulties.

Launching an e-government website has several advantages such as no boundaries, distance barriers and more.

To be precise, several factors are to be accounted for when government launches such an electronic service and wants it to be successful. These factors are: public awareness, this could be awareness of the computer literacy, linguistic skills, internet skills, awareness of e-government website(s), and readiness to use its services.

Several surveys were conducted considering the above factors among Stakeholders (Students, Experts and Farmers) in many Libyan cities. Moreover, after analysis of the collected data; we learned many important points that should be taken into account when lunching an e-government services to reach the optimum citizen participation and we discussed these points with observations/recommendations on how to improve upon the shortcomings. In addition, we have shown how to use alternative channel(s) such as mobile phones in case of facing infrastructure technical difficulties. Besides, conducted some of the successful local case-studies to draw more valuable results and recommendations.

Keywords: E-government, Libya, e-government services, e-government challenges, e-government stakeholders, e-government awareness, e-government enhancement.

1 INTRODUCATION

The objective of the study will contribute to help government officials planning to follow an e-government project and make people aware of it and its related infrastructure-details to develop a sound and reliable e-government transformation to reach the optimum adoption and participation from the public side in the developing countries. In addition, it will point out the challenges facing the government official as well as citizen; and offer recommendations for both of them to overcome these challenges. Moreover, it will offer alternative solution(s) represented in using Mobile phones since the majority of Libyans use these; and advice the government official to turn from e-government services project to m-government services project; when getting infrastructure-accomplishment is going to take time and effort or maybe getting impossible. That will be an interesting and an excellent recommendation and alternative solution not just for Libya as a case study here but for the other developing countries which suffer same challenges and have same opportunities to use the mobile phones to offer government services

The paper discusses various topics. Firstly, it examines the meanings, related issues of e-government and its services. Then, it focuses on the Libyan context and examines the challenges of e-government projects in technologically developing countries. Then, it describes the methods used to achieve the broad analysis of the extensive tests of the Spearman's Rank Correlation ,the Pearson Chi-Square and T-tests which were applied on the data collected from the three large studies (interview, paper-based survey and online survey) and other case studies such as Alharaba (a Libyan City (LC)) and the blind association. Finally, the findings, lessons learned and the conclusions have been transformed into recommendations to improve citizens' participation in developing countries as a whole and in Libya in particular with alternative solution.

1.1 The meanings and the related issues of e-Government

Two main points are emphasized in defining e-government: changing the way in which government delivers its services, and the use of information and communication technology. E-government means a new

way of delivering government services to citizens, businesses and other partners anywhere, anytime utilizing the power of information and communication technology. The "world bank" defines e-government as "the use of information and communication technology to promote more efficient and effective government, facilitate more accessible government services, allow greater public access to information, and make government more accountable to citizens (Basu 2004).

Background and context for Libya:

Libya is a large country in area but has a relatively small population that is approximately 5.6 million people; the demographics population are weighted towards the younger age groups, for instance, approximately 1.6 million people are in the education system. The population is dispersed over large areas-for instance 500 KM between cities with little in between (city population 2010). The e-Government projects can bring these localities so close as if they are all living in one city due to internet usage. It also makes it an ideal environment for providing electronic access to the government information and services by usage and availability of appropriate channels. Like many other technologically developing countries, resources in Libya such as skills, manpower, finances and infrastructure are very limited. The Internet cost is fairly high and there is no appropriate network infrastructure such as postal network. Although the wireless Internet is available; but it is at an extreme high cost which makes the average-income citizens unable to meet the cost of the service. The majority of the citizens have from average to low yearly Income; the citizens with high income represent a very small proportion. Moreover, majority of Libyans are not comfortable to use technology (especially Internet and computers), particularly officials and other specialists, although the higher government this year has tried to force officials to adopt the computer and the Internet technology but they are still struggling to make it work. As a final point, the distance and the cost causes the absence of an e-government project to deliver its services to the whole population, especially to the rural community (Sweisi, Adam, and Eldresi 2007).

2 CHALLENGES OF TECHNOLOGICAL DEVELOPING COUNTRIES

The challenges for e-government projects are more pronounced in technologically developing countries (Al-Sebie and Irani 2002). At a basic level there is likely to be limited access for many citizens to technological resources such as computers and the internet. Maybe, there are limited traditional resources such as roads & transport facilities and limited postal and communication facilities. In addition, there could be lower skills in using the technology, lower literacy and education levels besides having very limited economic resources and thus be less able to develop infrastructure and skills (Drake 2003, Moen 1994).

Public participation is an important element in many stages of the e-government process, from defining a society's vision and priorities for e-Government to determining e-readiness and managing e-Government projects. When it comes to e-government and public participation, we can consider all countries as developing countries. Countries are learning how to encourage, organise and manage public participation (West 2006). Public participation may be an issue in the technologically developed countries in activities such as voting (May less than 50% of the population). However, in developing countries, the same challenges are confounded by lack of communication infrastructure and ability to access and provide information.

3 METHODOLOGY

The population has been divided into three main groups (Students, Farmers and Engineers) besides other specialities. The studies through student's group (1.6 million in number) can be considered representing the opinion of the whole population. We chose ten (10) mostly-populated cities to carry out our studies

Pilot study: The comprehensibility of the survey was tested on 13 students 10 farmers and 15 professionals who had not been included in the study group and their opinions were considered to prepare the final version of the survey.

Data was collected by making a presentation about the surveys to the study groups and the survey was completed after the researchers obtained institutional and Government permits and participants gave verbal consent. Questionnaire was tested for validity & reliability, factor-loadings and internal consistencies of dimension items were high, as it measures (factors that challenges e-government projects to evolve and to reach the optimum citizens participations) concepts that we were intended to measure.

The investigating methodology consists of**:-**

3.1 The online survey responses:

An online questionnaire was hosted on the Libyan e-government website's main page. The response- rate was very positive and the number of responses reached three hundred and ninety six (396) in three weeks. The participants covered a wide range of groups, including Students, Engineers, Teachers, Doctors, Computer Professionals, Lawyers, University-Lecturers, Labourers, Vendors/Retailers, Policemen, Farmers, Unemployed, and Others.

Participation was spread across urban and rural areas, and responses were proportional to the population density. The questionnaire contained open and closed questions covering the use and awareness of e-government services and skills related to the usage of computer and Internet.

3.2 The Paper-Based Survey:

The survey covered respondents from 10 cities across Libya, and targeted three main groups in each city with five responses in each group (total 150 responses). The paper-based survey is a complementary investigation to

the online survey and covered similar questions and it captured Internet and non-Internet users.

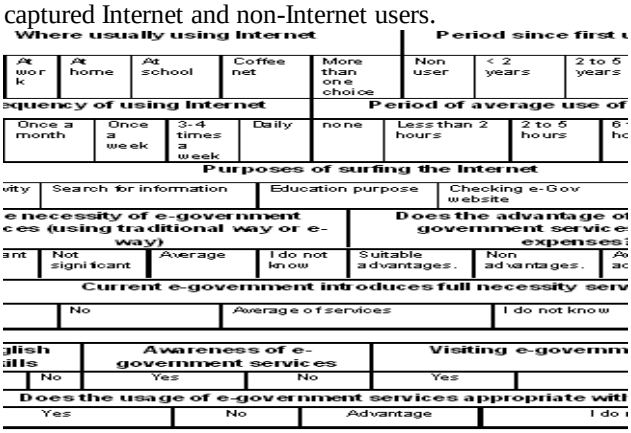

Table 1: Sample from the survey's questions

3.3 Interviewing the respondents and Alharaba case study:

Interviews with focused-groups were conducted which included people from Alharaba-case-study, blind association-Benghazi (LC). We also interviewed the key stakeholders involved in the delivery of e-Government services (6 interviews) and those involved in a "vaccination case study" at the National Centre of Fighting Contagious and Threatened Diseases (NCFCTD using SMS messaging to inform families about vaccinations - 9 interviews).

4 THE ANALYSIS METHODS:

The analyses were conducted on data collected by the surveys and the investigation instruments used have been illustrated next:

4.1 The Spearman's Rank Correlation test:

4.1.1 The Online survey data Analysis of the nonparametric Spearman's correlation test : The sets of data are considered as parametric, a Pearson-correlation would be appropriate here. There may be some who argue that "education" and "computer skills" might be negatively correlated because "computer skills" need "educated" people leaving the uneducated people having less chance to gain "computer skills" and thus are not aware about "e-government services" and "e-government website", then they may select a two-tailed prediction. All these options are easily dealt with in the statistical analysis by simply applying a non-parametric correlation "two-tailed prediction test" and that is what this research paper followed in the entire correlation test's analysis.

The "Education" is not correlated (has no effect/relationship on both sides) with each of the following variables__"compatibility of Internet with lifestyle", "cost as a barrier using Internet", "readiness for using e-government website if you have got fitting courses", "e-government services developed enough". However; the *r*=.117* which denotes that there is a weak positive correlation/relationship between the "education" and the "computer skills" variables. Despite this, the effect of the relationship between the two variables is statistically significant because the Sig.(2 tailed *P-Value*=.020) and

Nonparametric Correlations for the online survey (396 participants)

		Education	Computer Skills	Compatibility of the Internet with lifestyle	Cost as a barrier using internet	Readiness for using e-Government websites if you got fitting courses	E-government services developed enough
Education	Correlation Coefficient (r) Sig. (2-tailed) (p)		.117* .020 (A) (r): Weak correlation (p): Significant effect	.034 .498 (B) No correlation	-.024 .635 (C) No correlation	.023 .648 (D) No correlation	-.052 .302 (E) No correlation
Computer Skills	Correlation Coefficient (r) Sig. (2-tailed) (p)			.337** .000 (F) (r): moderate correlation (p): highly sigficant effect	.076 .130 (G) No correlation	.174** .001 (H) (r): weak correlation (p): highly sigficant effect	.099* .049 (I) (r): weak correlation (p): significant effect
Compatibility of the Internet with lifestyle	Correlation Coefficient (r) Sig. (2-tailed) (p)				.003 .954 (J) No correlation	.250** .000 (K) (r): weak correlation (p): highly sigficant effect	.078 .122 (L) No correlation
Cost as a barrier using internet	Correlation Coefficient (r) Sig. (2-tailed) (p)					.173** .001 (M) (r): weak correlation (p): highly significant effect	.199** .000 (N) (r): weak correlation (p): highly significant effect
Readiness for using e-Government websites if you got fitting courses	Correlation Coefficient (r) Sig. (2-tailed) (p)						.253** .000 (O) (r): weak correlation (p): highly significant effect

Table 2: the non-parametric corr test of the online survey

since our significance level of *r* was set at .05. I.e. the increase in the level of "education" increases the "computer skills". In contrast, the lesser "computer skills" they have the lesser "educated" they are likely to be. The correlation/relation is weak as the *r* and *P-Value* are close to zero, which means significant effect in this relationship. Each variable affects the other one highly in a positive direction as predicted (Increase/decrease together which is called a two-tailed prediction)) The "Computer skills" and the "compatibility of the Internet with lifestyle" are positively and moderately correlated. The r=.337** and, the sig.(2 tailed *P-Value*=.000) which means the relationship between the two variables has a highly statistical significant effect proving that as the "computer skills" increase so does the "compatibility of the Internet with lifestyle" and vice versa.

However, the "computer skills" of the participants have no correlation with the "cost as a barrier using the Internet" in cell (G), as *r*=.076 ≈ zero which means no correlation (*P-Value*=.130 being >0.05 and <0.01 indicates no effect). The results show that participants belonging to lower income groups and rural areas had more knowledge and interest to use internet facilities. These people used net-cafes and computer centres, as they did not have internet-access at home. On the contrary, the participants from the main and high-income cities did not have enough time and interest in having extra skills such as computer and Internet.

The "computer skills" of the participants has a significant correlation with the "readiness for using e-government website if they have got the fitting course". The r value=.174** which denotes that the correlation is weak but as the *P-Value*=.001 indicating that the two variables have highly significant effects on each other. I.E. the more "computer skills" they have the more "ready they are for using e-government website". In contrast, the lesser "readiness of participants for using the e-

government website" the more lacking in the "computer skills" they are. The "computer-skills" have a weak correlation with the "e-government services developed enough" since the r=.099*. However, the *P-Value*=.049 indicates that the relationship between the two variables has significant effect in the positive direction. I.E., the more "computer skills" they have the more knowledge about "if the e-government services developed enough" they have; in both direction. Some values indicate that a major chunk of participants is forced to refrain from using the internet due to its access-cost.

4.1.2 The Paper-based survey Analysis of the nonparametric Spearman's correlation test: There were several significant correlations between each of the variables included on the paper-based survey. In fact, most of the variables were: either positively or negatively correlated with each other.

As a final point, we analysed the all numbers data with the same rules as above taking care of the sign of each value. We check the *r*-value and its associated level of significance (* or **). A "*" indicates usual significance and "**" indicates higher significance which are proved to be true during this analysis

4.2 The Pearson Chi-Square test:

4.2.1 Online Survey Analysis of the Pearson's Chi-Square Test: We test all variables in the online survey against the dependency on one another. Generally, in the online surveys, applying the Pearson's Chi-Square test resulted in most of the variables showing insignificant Chi-Square values indicating that they are completely independent of each other. This is a sign of no relation between them, except few significant relationships (five in total) between variables.

4.2.2 Paper-Based Survey data Analysis of the Pearson's Chi-Square Test: There are several significant relationships between each of the variables included on the paper-based survey instrument based on the Pearson Chi-square test. We also applied the Spearman's correlation-test to distinguish how effective the relation/dependency is. Mainly, each one of the variables is significantly related to one another with the exception of one. Here, "Period of first use of the internet" and "Does current e-government introduce full necessity service," are not well related as is evident by the value (insignificant χ^2=.769, *p*=.681 and df=2). This means that no relation exists between them; hence they are independent.

For the remaining Chi-square tests; each variable is significantly related to one another, and the relation is effected through one variable depending on the value of another variable, that means they were not independent. As, the χ^2=183.450, *p*=.000 with df=6, .which indicates that the variables were significantly related and the levels of "Frequency of using the internet" were related to the levels of "Period since first use of the internet". Thus, the two variables are dependent, and the (Corr. *r*= -.970), *P*=.000 confirms the strong effect of the dependency.

Similarly, the variables: "Period since first use of the internet" and "The necessity of e-government service using tradition or electronic way" were significantly related to one another, as χ^2=6.289, *p*=.043 with df=2. This represents that the two variables are related and thus are dependent ((Corr. *r*=.198), *P*=.045). This shows that the dependency in some way is effective.

4.3 The Independent T-test:

4.3.1 Online survey Analysis of the independent t-test: The Independent Samples T-test contains the statistics that are critical to evaluating the current research questions. That verifying whether people with "English skills" and people with "an awareness of e-government services" are different from each other. Thus, they are dependent which is indicating that there is a statistically significant relation between the two variables. Again it should be prove by correlation test which should (sig.(2-tailed >= 0.00 and <0.05). The T-test statistic under the assumption of unequal variances has a value of 11.159, with an associated significance level of .000. The small value in the column labelled Sig.(2-tailed) indicates that the groups do indeed have unequal variances. The significance level tells us that the probability of there is (no relation) between (the two variables) is not true. Thus, there is a significant relation between them.

In contrast, the same thing applied for if people with "English skills" and people who are "visiting the e-Gov website" have an equal variance and they are dependent on each other. The T-test result sig.(2-tailed=.545) >0.05 is insignificant; this is mean variables are Independent and there is no relation between them, also there is no relation in the correlation test.

4.3.2 Paper-based survey Analysis of the independent T-test: The t-test for the paper-based survey signifies that all variables are dependent on one another and they all have statistically significant relation between them.

5 THE FINDINGS AND THE LESSONS LEARNED

The findings, lessons learned and the recommendations (in the conclusion) provide some guidance for Libyan government to make its first steps toward implementing successful and perfect e-government project. They must consider implementing the alternative solution.

The most important findings in this paper are the following:

- The North East area is "The silicon valley of Libya" with high level of skill and interest in computers, Internet and awareness of e-government services.
- Education is not the main factor that makes people more prone to Internet technology, awareness of e-Gov website and using its services; as good case-studies and examples were found in rural communities (such as Alharaba) proved that. In contrast, the more educated people from urban areas have no idea about e-Gov website and its services. General literacy is prerequisite to do anything.

- A number of respondents acknowledged that studying abroad offered the opportunity to gain and extend their knowledge of computer-and-internet related skills appropriate example are of people studying abroad and then running local training centres back in Libya (Alharaba and Musrata (LC)).
- High levels of awareness were not limited to the cities and high economic areas as initially expected. Good case-studies and examples were found in remote rural communities such as Alhraba and in specific regions such as North-east areas and Misratah.
- Besides, extensive courses on special Internet applications were conducted at the Blind Association which polished their skills and made them go further in their graduate studies, using the Internet and aware of e-government aspects.
- Very few contributions from the females' side were observed as males are dominant (typical developing nation style).
- The high cost of Internet services in general, forms a barrier for the public to interact with e-government website and of its services.
- Lacking the English skills could not cease people from using Internet or visiting e-Gov websites.

In addition, the lessons learned are been noted in the following points:

- Belonging to the high-income area does not mean having high awareness of Internet and computer literacy as has been seen during the case study of the north-east area which is populated by low-income citizens.
- By introducing reforms on how government works, how it manages information and internal functions, and how it delivers services to citizens and businesses might produce all the benefits expected from the time and money invested.
- Simply bringing in technology such as (computers, networks and communication devices, etc.) will not improve the e-government and make officials more service-oriented toward government's customers, nor will computerising the same old procedures and practices since Information and communication technologies are only tools to enable and authorise government reform.
- New and existing technologies should be used as means for achieving the larger goals of the government and the people. Instead of focusing on the technical aspects of e-government, governments should think about creating an intellectual and information people based approach responding to customer needs and changes in the internal and external environments. There are good examples of social networking, which makes use of local (people and expertise) gaining success in implementing new ideas. This, eventually, encourages the community to participate in online e-Gov services as users.
- Improving people awareness; by delivering courses on computers, internet and knowledge on getting and using search-engines on websites and e-Government services. There are examples that we can use as good basis (Alhraba Village, blind association -Benghazi (LC) and disable Association).
- An instance of good practice involving talented and motivated individuals is of these studying abroad and bringing their expertise back to Libya and applying it at the local and the national level. These local champions know the requirements of the local environment and are best suited to apply their education. The practice of sending students to study abroad continues to offer a concrete basis for improving the adoption, sharing and transferring of new technologies skills.
- More generally, supporting the educated people and local champions who are ready to contribute to help and encourage the people for better understanding and usage of new technologies by conducting suitable courses to the people as these local champions are from same culture and are familiar with the people in a particular area.
- Increase the awareness of the people with new technologies by offering computers, access to internet, anytime, anywhere and by conducting training courses cost which is compatible with the common citizen's income. The paper recommends establishment of free government training in every area.
- Government should collect and implement the ideas from other regions or countries, which have successfully implemented similar projects. However, these ideas should be localised based on culture and resources. Just visiting and having discussions with the agencies who have implemented such ideas is not sufficient. The process should be properly reformed comparing factors like availability of computers, literacy and internet-access. This is relatively a low-cost way of learning.
- Support social networking for its proven power and success (for example, SMS vaccination program).

6 CONCLUSION

The conclusion draws more valuable results and recommendations besides the findings & the lessons learned above to improve e-government-participation of citizens of developing countries as a whole and Libya in particular. The conclusion also proposes the alternative solution. As in this survey, analysis of collected data from the questionnaires, distributed to Stakeholders (Students, Experts and Farmers), it was seen that the first thing to be considered is the lack of computer literacy due to the high cost of computer machines. Consequently, the level of computer-related skills among the public is extremely low. Moreover, having English skills and/or being educated does not necessarily mean having computer and Internet skills. Besides, most of them proved to be unaware of e-government services. This unawareness can

be improved with appropriate level of utilising the case studies such as Alhraba, north-east of Libya and Benghazi blind association. Advertising this information with all levels of people to let them know what is going to happen, why and how is it related to them. Involve people from vision to implementation stage, by using efficient of channels. Practical government can provide with this information by distributing loans, encouraging local champions to establish technologies centres, through establishment of internet clubs, centres and providing (free) training courses.

On the other hand, the Internet related Infrastructure in Libya is very limited and in some cases, it does not even exist. Consequentially the common public cannot easily have access to the Internet and thus cannot use e-government sites. Moreover, the high cost of Internet-access limits the access time for people who have access to Internet. Consequently, this Internet is not compatible with their lifestyle. Even when they do surfing the Internet, visiting the e-government website is not their main purpose. Of course, there are some exceptions.

We also notice that the number of services offered do not satisfy the needs of most of the people. Number and quality of the provided services must increase to a level, which encourages the common public to use e-government facilities. Moreover, the idea of e-government needs elaboration. We should advise people about what are the advantages of the e-Gov over the conventional governance.

In contrast, the majority of stakeholders are ready and willing to use e-government services and support it if proper training given to them. It is preferred that the Government takes an initiative to build an appropriate infrastructure to provide these two services (hardware and training). To be exact, if the e-government does not provide or build that infrastructure; there will be a small number of the public only who could interact or make use of e-government services. This will be improved by making landline phones available in every home or/and making wireless internet technology available and reduce its cost. This will result in encouraging the public to have internet access and skills and thus have more access to e-government website. Besides, it should reduce the cost of computer-hardware and associated training courses.

Hence, there is a strong need to look for an alternative to reach most of the people. The other and an excellent recommendation and alternative solution is the use of m-government: To reach to people by using wireless channel - mobile phones (SMS messaging). NCFCTD successfully employed this method when they initiated the vaccination program and announced it through SMS messaging using two mobile companies Almadar and Libyana. The various vaccination programs were successfully completed on-time with 100% attendance all over the country. Additionally, they disseminated the program in the social gatherings, work places, neighbourhoods, etc thus making good use of Social network. Consequentially the messages reach those who missed them in case of full inbox mobile folder (Sweisi, Adam, and Eldresi 2007). The Services by the two mobile companies mentioned above cover most of the populated-Libya.

The Dubai Government effectively used this method to allow its citizens to use various services like payment of Utility Bills, getting Bus and Train Passes etc. Using this alternative (m-government), we can also reach specific target-groups like Blinds by deploying applications on specialized mobile phone. Mobile phone is a very reliable device to ascertain a person's identity except that when the device is stolen. The Mobile service has another good characteristic for it being available during twenty-four hours.

By using this facility, there will be no barriers to reach the target segment of the society in an effective and efficient way with limited cost and on-time. A related study found that a very large chunk of the population (more than 80%) possesses mobile phones and this number is growing every day. Thus, m-government proves to be the best alternative solution to reach the population until the government improves Libyan Internet related infrastructures.

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Etc.

Problem-based Learning – the Possibility of Networking Schools, Universities, and Communities /Case of Lithuania/

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ABSTRACT

Since 2003 in Lithuania career guidance centers functioning in more than half of comprehensive schools have been established; different projects on the topic are being prepared; however, it is possible to find more different variants for the solution. Problem-based learning based on networking schools, universities, and communities could be the possibility.

The aim of this article is to disclose problem-based learning as possibility of networking schools, universities, and communities in solving improvement of person's career guidance process.

Methods: analysis of scientific literature and documents, modeling.

Networking schools, universities, and communities can focus on pupils' career guidance and be based on problem-based learning. Understanding problem-based learning as learning strategy of a subject, it would be possible to optimize self-directed learning of every network participant (schools, universities, and communities) and its members, and to obtain synergetic effect for the solution of problem of pupils' career guidance.

Networking schools, universities, and communities is peculiar; so each of them has to identify the problem, its emergence reasons, to project alternative scenarios of its solution by choosing optimal and concretize its implementation by assessing its content and context and expanding networking collaboration by identifying potential partners.

Keywords: Networking, Schools, Universities, Communities, Problem-Based Learning, Career Guidance.

INTRODUCTION

In the progress of every society collaboration of schools, universities, and communities has been an important triangle influencing its development. Today in the dynamic society, which is influenced by emerging and developing new technologies, this triangle obtains the specific importance because pupils are educated at the comprehensive school located in the particular community. They are potential students of universities. During their studies at university they should not lose the relationship with their community and school because, due to their knowledge about the peculiarity of the community and school, they can model potential relations with the community and school. It is evident that one should choose certain content space and form. Problems of vocational training and unemployment become more and more relevant. According to the data of the Lithuanian Department of Statistics, there were 14.8 percent of the unemployed in the third quarter of 2011 [1]. Thus the topic of professional career can be one of possible ways of networking schools, universities, and communities. Its solution can be based on problem-based learning.

The aim of the article is to disclose problem-based learning as possibility of networking of schools, universities and communities in solving the issues of improvement of person's professional career guidance process.

The research object – is the problem-based learning on the aspect of networking among schools, universities, communities.

The research methods: analysis of scientific literature and documents, modeling.

The topic of the problem-based learning (PBL) is not new. Different scientists have analyzed it. For example, the book by J. Davies, E. Graaff, A. Kolmos (2011) "PBL across the Disciplines: Research into Best Practice" presents PBL in the viewpoint of different authors (Ch. Beaumont, L. Norton, H. Tawfik; M. Duncan and others) in different aspects: different PBL approaches, PBL and ICT, PBL across disciplines, PBL in engineering education, industry collaboration, competences and development of professional skills and so on. This article presents a new approach to the PBL as potential possibility of networking among a school, university and communities in solving the possibilities of informing a person on his / her professional career issues [2].

This work is theoretically important because it presents the scheme of networking schools, universities, and communities based on PBL is presented in order to improve the process of person's professional career guidance.

It is important practically as well because the scheme can be modified in the concrete environment of networking.

LINKS BETWEEN PROBLEM-BASED LEARNING AND NETWORKING

The problem based learning is differently defined. For example, H. Barrows (1989:1) defines it as: *The learning that results from the process of working towards the understanding of a resolution of a problem. The problem is encountered first in the learning process* [3].

The website of DIT School of Physics presents the PBL definition: Problem based learning (PBL) is a total pedagogical approach to education that focuses on helping students develop self-directed learning skills [4]. It was originally developed in medical education in 1960s but has since spread into other subjects. It derives from the theory that learning is a process in which the learner actively constructs new knowledge on the basis of current knowledge. It has already been adopted in other fields including business, law and education, etc.

But one has to agree with T. Barrett (2005, 22) who states: *I consider that PBL is not merely a teaching and learning technique, but a total approach to education.* According to her, *problem-based learning is considered as a total education strategy* [5].

In the issues of professional career it is purposeful to refer to PBL because this is the problem, which has not possessed appropriate solutions yet and which can be initiated. Thus networking schools, universities and communities is useful. Since 2003 career guidance centers have been established in Lithuanian schools; their aim is to ensure that services of career guidance would be available and would meet consumers' needs [6].

At present in Lithuania there are 696 career guidance centers – the work places, in which career guidance services are rendered; they have free access to the Internet, the access to the databases of education and labor market in the country as well as the accumulated career guidance material on computer files, video tapes, and publications (ibid). However, even though they render career guidance services to pupils at almost half of comprehensive schools in Lithuania, there is no close collaboration with either universities or communities yet. It is possible to *a priore* state that networking schools, universities, and communities could become alive link among people studying at university, work world representatives of particular communities as well as a particular pupil in the field of career guidance. This would contribute to relate different knowledge, experience in assessing the needs of a particular pupils; as well as communities could have the information about expectations and needs of students and pupils in their disposition: this would necessarily got disclosed during the networking.

It is evident that to pursue for the aim it is possible in different organizational forms. The organization of PBL based courses online would be very attractive. It would allow learners to use different forms of problem-based learning and teaching online courses. Such organization of the courses would allow a learner to choose important courses for him / her at a comfortable place and convenient time for him / her. It is evident that online consultations of professionals would be very important for him / her, as well as given possibilities to identify his / her achievements and professional profile, etc.

However, it is not so simple to organize persons' guidance on career issues online. As the material of Boise State University and the Buck Institute for Education, (2007) states:

There are three 'conditions' that are necessary for successful problem-based learning:

1) *A strong teacher-student relationship*. PBL works best when you have established a positive, communicative relationship with your students. PBL is a community-oriented, relationship-driven style of teaching and learning. If you enjoy working closely with students, you will enjoy Project Based Learning.
2) *An atmosphere that emphasizes rigor and accountability*: If you have set high standards for your students—and they know what is expected of them—they will perform much more successfully in projects. Project Based Learning requires that students take responsibility for their own learning. The more they understand the importance of solid learning and being accountable for results, the more they will be self-directed and high-performing.
3) *An opportunity for student involvement*. Project Based Learning does not require that your classroom be 'student-centred.' However, it does require process-oriented instruction. That is, you are in a constant dialogue with your students about what they are learning and what is important to them. Respectful listening and good communication will improve the quality of your projects [7].

Thus it necessary to formulate the conception and principles of online professional career guidance based on PBL. Referring to them, it is necessary to project their implementation model by invoking networking schools, universities, and communities. The projection and implementation of the model should also be initiated in order that namely these three members of the networking would become not only become interlinked in sharing theoretical knowledge and practical experiences but also would become agents of its improvement.

THE SKETCH OF THE SCHEMA

When projecting the model, it should be started from the cohesion future representatives of networking schools, universities, and communities, improvement of the activity of pupils' career guidance and / or the search for other possibilities. So it is necessary to evaluate the Seven Jump Approach distinguished by H. Schmidt and J. Moust **(Figure 1**).

Figure 1: Seven jump approach

1. Clarify unknown terms and concepts in the problem description.
2. Define the problem: that is listing the phenomena to be explained.
3. Analyze the problem: 'brainstorm': try to produce as many different explanations for the phenomenon as you can. Use prior knowledge and common sense.
4. Criticize the explanations proposed and try to produce a coherent description of the processes that, according to what you think, underlie the phenomena.
5. Formulate learning issues for SDL [self-directed learning].
6. Fill in the gaps in your knowledge through self-study.
7. Share your findings with your group and try to integrate the knowledge acquired into a comprehensive explanation of the phenomena. Check whether you know enough now.

(Schmidt and Moust, 2000:23)

Each position distinguished by these authors is important on career guidance issues by applying networking schools, universities, and communities. As this topic is attempted to solve in Lithuania but not have been solved yet as well as other alternatives of its solution have not been presented (networking schools, universities, and communities has not been publicly discussed yet), the first step is important because it would stimulate the disclosure of topics of the unknown problem and its possible conceptions for their formulation, the second jump – to define the problem, the third one – to analyze the problem by means of 'brainstorm' in order to identify the phenomenon as clear as possible. The fourth would induce the criticism of what is presented and try to produce a coherent description of the processes; the fifth – to formulate learning issues for self-directed learning; the sixth – for everyone to individually fill gaps through self study. The seventh would enable integration of own discoveries into the phenomena in order to identify it.

So the possibility to model alternative scenarios, which could be not only identified due to the networking schools, universities, and communities but also to implement and constantly improve them, would emerge. Modeling of scenarios should be discussed by assessing their advantages and disadvantages with reference to assessment criteria and indicators. Having chosen the best one, it should be discussed with the subjects interested in the improvement of pupils' career guidance (e.g., municipality, youth organizations and so on). If it is necessary, the scenario should be corrected or even a new one, which would be optimal, should be prepared. Then the concretization of its implementation strategy, which is discussed in the network and with the subjects and / or its potential partners interested in its implementation, takes place. Of course, monitoring system, which helps predict possible hindrances and their overcoming, is also necessary. Referring to the conception of the problem-based learning as learning strategy, corporate culture will form and self-directed learning, which presupposes possibilities of corporate work in order to improve networking schools, universities, and communities, will be implemented.

All activities should be united into Networking among a schools, universities and communities in solving the possibilities of informing a person on his / her professional career issues scheme and should be planned in accordance with existing content and context.

This schema should be divided in to eight actions (**Figure 2**).

Figure 2: Networking schools, universities, and communities

1. To establish networking among networking schools, universities, and communities.
2. To clarify the cohesion of future representatives of networking schools, universities, and communities, improvement of pupils' career guidance activity and / or the search for other possibilities.
3. To model alternative scenarios of networking schools, universities, and communities, improvement of the activity of pupils' career guidance.
4. To identify the best scenarios.
5. To develop strategy of implementation of this scenarios.
6. To check this strategy.
7. To implement this strategy.
8. To evaluate this implementation (the monitoring system).

CONCLUSIONS

Networking schools, universities and communities can focus on the relevant problem – pupils' career guidance and be based on the problem-based learning. Understanding the problem-based learning as learning strategy of a subject, it would be possible to optimize self-directed learning of every network participant (schools, universities, and communities) and its member as well as to obtain the synergetic effect for the solution of the problem of pupils' career guidance.

The networking schools, universities, and communities is peculiar; so each of them has to identify the problem, its emergence reasons, to project alternative scenarios of its solution by choosing the optimal one and to concretize its implementation by assessing its content and context and

expanding the networking collaboration by identifying potential partners.

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(Edition Post-Conference)