A comparative study between two student groups of Physics in the Pre-college Educational System

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ABSTRACT

As an interesting experience on the teaching-learning process, Moodle e-learning platform will be implemented in one of the two pre-college level physics groups in the Chapingo Autonomous University, that is, those students completing the requirement course in order to be admitted at the college level. This study will show how the use of new technologies improves the learning progress linked to physics concepts and through these worksheets. The first group will be working with class activities in the classroom of physics. The second group will be monitored with the platform Moodle as external e-media. This latter group will be selected from pre-college students in Regional Centers outside the Chapingo Campus. The application of Moodle has not been implemented in the study of Basic Experimental Physics. This proposal has been designed in four stages. The first one defines the theoretical framework and describes the didactic model, which consist of three kinds of worksheets. The second stage displays the results between similarities and differences in both groups, as resulting from the worksheets (conceptual, phenomenological and experimental-formal). The third stage includes the discussion on the information collected and how this new technology could improve the physics learning process in pre-college students. Finally, the last stage gives information on how e-learning might be an alternative implement in other campuses.

Keywords: Physics, Moodle, Pre-college, Worksheets and E-learning.

1. INTRODUCTION

With this study, it is possible to validate the use of ICT to improve the teaching-learning process of physics at Chapingo, using worksheets that contain six elements:

1. The problem
2. The situation
3. The prediction
4. The experiment
5. The comparison
6. The conclusion

The problem, briefly presented, that is, the focus of the conceptual difficulty to be treated in the worksheet; **the situation**, where the problem is contextualized in one or two experimental situations, each of which can overcome a well-defined micro conceptual step; **the prediction**, for each situation students foresee the outcome of the experiment, whether real or ideal, either with respect to any quantitative or qualitative aspect; **the experiment**, students conduct the experiment or the experimental observation simple, with a view to the particular aspect selected and described in its essential aspects; **the comparison**-- students compare predictions and results of the exploration conducted, to identify similarities and differences; **the conclusion**, it develops a conceptual summary, It includes achievements in the conceptual micro-step and the explorative worksheet concludes and it gives guideline to new questions, that is to say, it directs the analysis for new problems. The lack of trained teachers in Physics and Teaching Physics, in the others campus produce the need to develop teaching resources that can help to solve the complex problems. The use of technology permeates all areas of human endeavor, and education is no exception. The teaching of physics is also incorporated the use of the computer in which offers different levels.

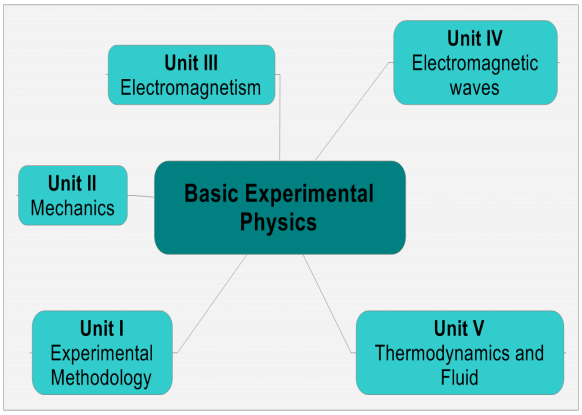

Figure 1.- Basic Experimental Physics Program (BEO) at the level Pre-college.

This gives as a result important training aspects as: the active and direct responsibility of the student with his own training process; promote independent and autonomous work, allow representations of

information tailored and characteristic of each student by the didactic resources, and assume significant conceptual value. F**igure 1**, shows the course of experimental physics, which uses exploratory learning activities in order to enhance student learning.

It is important to incorporate new strategies into the school system and to consider ways of facilitating such incorporation: resource materials, access, presence, teacher training, organizational models, and conceptual foundation of educational practice. Chapingo had not incorporated teaching resources using ICT (Information and communication technologies) to support teachers in physics. Thus, it is important to train teachers in the use of ICT, and be clear about the potential that the new information technology and communication holds, especially the fact that the training is not only for instrumental use but also for teaching purposes. It should also be considered that teachers are not only media consumers, but designers and producers, as for example, in an exploratory teaching technique as the one shown in **Figure 2**, called an "alternative" teaching organizational planning.

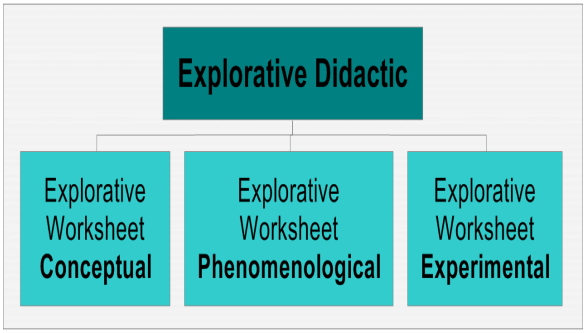

Figure 2.- Three different types of worksheets.

2. PROBLEM

It has been observed how different models of teaching learning process have been enriched by integration of technologies. Clearly, we are in a stage of rapid technological development and learning in online contexts of science, and particularly in Physics, it is now very frequent. The use of ICT has evolved new possibilities to explore and capitalize aspects in the planning and development and analysis with the information from worksheets, will teaching approach will promote understanding of physics concepts and the empowerment of the dynamic of information. The worksheets are exploratory sources with important information about physics concepts that the students know based on qualitative research.

Furthermore, it is a constant concern of the Physics Department in the central campus to hire qualified teachers in physics to the other centers. In this centers the teachers need adequate training to teach courses of BPE.

The solution are the use of ICT's, with a didactic based on data collection that seeks to explore what students know, and the teacher can act accordingly to support the process teaching-learning to physics concepts.

3. OBJECTIVE

Research in order to project a virtual learning in physics with comprehensive vision and exploratory experiences that allowing training acquired and with that identify learning difficulties in studying physics concepts.

4. HYPOTHESIS

If we monitor the learning of BPE through exploring and documenting the training achievement and learning difficulties with the use of ICT, and become tools of design, reflection and data collection on the learning processes of students only then can assert itself as a resource teaching and learning. For that, you need to develop the virtual space that contributes to this objective support and include multimedia resources (readings, videos, images, animations and simulations), based on the proposal of an exploratory teaching to help in understanding the concepts BPE in the Centers Regional of Chapingo Autonomous University.

5. THEORETICAL

The new technologies can articulate strategies pedagogies into the multiple forms of communication. Although there is a tradition in the sense that cognitive-constructivist thinking derives from the personal construction of knowledge, developed largely by Piaget and his followers, the roots of the constructivist model most widely applied today stems from the work Vygotsky [1]. These developments come together in the broad category of social constructivism. From a process of exploration to provide explanations for better understanding of the interaction for educational, social communication with emphasis on implementing processes for developing dialogic communication areas of physics that operates complementary to the education offered formally in Chapingo.

The socialization of science is intended in their socio-historical meaning and also it must facilitate communication that it promotes dialogue among participants to shape opinion in the field; aspect itself is excellent and desirable as a goal of democratization

of science [2]. The research methodology will be a resource of dialogue itself from what we have named as explorative learning. All Strategies and means than allow used communicative elements as exploratory worksheets, for instance, it can be summarized in three groups: phenomenological worksheets, for exploration of phenomena and characterization study with empirical laws; another one, the conceptual worksheets that build exploring the concept with different hypotheses of interpretation and its consequences on the experimental-formal worksheets that guide students to the mathematical representation of observable concepts [3].

We seek to identify the physics contents, so that learners:

a) There must be dissatisfaction with existing conceptions.

b) The new conception must be intelligible, that is, the student must understand how the new concept can be structured to the past experiences.

c) The new conception must appear initially plausible. This is especially difficult to achieve at times, as some scientific theories have aspects that are counter-intuitive.

d) The new concept should be useful, it should suggest new possibilities for exploration and it must provide new insights to the student. The new design should solve the problems created by his predecessor and explain new knowledge and experience.

6. METHODOLOGY

Through exploratory worksheets, we are looking the core knowledge build, theoretical and experimental experiences and develop teaching materials to help address the subject of BEP in a useful way for teachers and students. For Chapingo Unit and Regional Centers where the subject is taught Basic Experimental Physics, materials will be available on Moodle platform in order to interested parties upon request [4]. It is noteworthy, that we are not intended to substitute to the teachers in the perennial teaching.

The importance of our study is that it contains the acquiring language meanings as representation changes. As the use of language is essentially a social situation and discursive use subjective appropriation of the natural world for empirical achievements, culture science, in physics, is no stranger to this. Conceptions scientifically coherent knowledge accepted by the scientific communities need to be built, internalized, through processes that most likely involve conceptual changes [5].

For our research, exploratory analysis to the worksheets provide what words and what categories are used as for which phenomena, for what purpose and at what time and context are used, what alternatives and meaning given to it in the narrative of an experience or event. In terms of general physics course structures we have found that student learning is improved when the students work actively involved by using activities guided by worksheets. This is referred to the theoretical-experimental experiences and physical phenomena seen during the course of BEP.

Our instrument to collect information for research draws on the central ideas of the exploratory analysis model, part of the proposed Marisa Michelini and Alberto Stefanel [6], where the chips exploratory refer to the following general scheme, shown in **figure 3.**

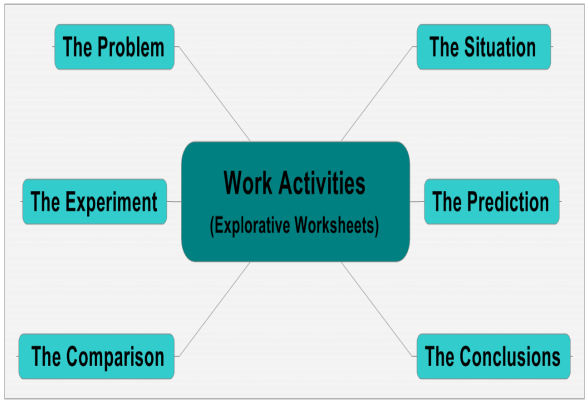

Figure 3. - Each worksheet contains six aspects to explore.

For analysis the conceptual foundation and conceptual change through exploratory chips as our instrument for data collection, it should follow the following guideline proposed in the following stages [7]:

- Step one: research questions
- Stage two: sample selection
- Step three: gathering information from worksheets.
- Step four: contrasting.
- Step five: The encoding
- Step Six: analysis
- Step seven: validation
- Step Eight: report

7. CONCLUSIONS

1. With a combination of investigation quantitative and qualitative the evaluation is possible to assess the

effect of virtual space and the approach of learning-explorative to the subject of Basic Experimental Physics.

2. The results are compared through the analysis of the information gathered, that it would provide elements to consider in other educational environments how prudential and virtual.

3. Research can promote the development of a virtual environments learning physics precollege level in Chapingo and all information must be analyzed and recovered in order to take decisions based on the proposed monitoring explorative learning.

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