1. ABSTRACT

The gap opened by the brain drain due to global work force mobility, on the one hand and the speed at which new knowledge and technology are being developed on the other is growing wider every day. Paradigm shift is paramount; business models are being reviewed and revamped. Skilled hands are not the only feature in demand for the implementations of new technologies. Trained minds with sufficient background and the ability to investigate novel approaches are required even more. Stakes are higher today, as sustainability and awareness to the environment are top on the agenda in any new engineering and innovation endeavour.

South Africa has embarked on a venture to increase its delivery for more engineers, technologist and other essential career streams required to fill up the skill shortage gap. As key players, tertiary institutions extend themselves into enrolling massively with an objective to produce as many graduates as possible and contribute their bit to address the challenge.

The competency of candidate students in basic numeracy and literacy is a great debate topic. Mathematics, science and physics skills of applicant university students seem to leave a lot to be desired. An ongoing debate suggests the extension of the average three years stay for undergraduate university qualification to four years, which can be detrimental especially in an environment where the workforce is starved with skill shortage. As the relevance of the curriculum offered is being questioned, tools that are made available to assist the learning process are under investigation and their effectiveness assessed.

This paper discusses the interim results of an ongoing observation and study on relevance of the effective use of other teaching and learning modes afforded by technology, in the particular case of handling big class groups. A comparison of the pass rates between groups of students participating in traditional classrooms and those exposed to the blended learning mode that includes an online component.

Keywords: blended learning, embed questions, Moodle, online tutorial, pass rate

2. INTRODUCTION

In 2000, the American Society for Training and Development (ASTD) and the National Governors Association (NGA) convened to form the Commission on Technology and Adult Learning [1], with a mandate to define and encourage a technology-enabled learning environment that would result in an engaged citizenry and a skilled workforce for the digital economy. The commission focused its attention on technology-enabled learning designed to increase workers’ knowledge and skills so they could be more productive, find and keep high-quality jobs, advance in their careers, and have a positive impact on the success of their employers, their families and their communities. E-learning was spotted for its potential as a tool for reducing the costs of workplace-related education and training as well as its ability to offer universal access to the best-in-class learning content, as well as a wide variety of content available anywhere in the world. In traditional training delivery, the student needs to adjust to the training presentation schedule in order to grab the maximum benefit and is in most cases confined to the content as presented in class. This study observes two groups of students registered for introductory applied mechanics. The first group is made up of fulltime students. The second is made of part-time students who can only afford two hours class a day after work. In an environment where students are exposed to labour intensive work prior to attending two hours class, in the afternoon, the maximum of their best performance is not to be expected. Human limitations, unresolved outstanding plants/workshops issues could take the toll out of them. In some instances they just cannot afford attending class, particularly in cases of unexpected shut downs or any other work related matter. Computer Based Learning (CBL) kicks in and reveals to be the alternative of choice. Wentling et. al present Karon’s advocating for the convenience factor of well-designed computer-based training [2]. Karon argues that any well-designed computer-based training - whether it is local intranet based or delivered via the Internet - is more convenient than traditional instructor-led training or seminars, as self-paced Computer Based Training (CBT) courses are available when students are ready and able to complete them, not just when the seminar or class is scheduled or when the instructor is available. Class content becomes portable. The portability of the class content does not however overshadow the trainer’s role though. Trainers need to redefine their role, as their work design and environment changes. Stemming from their traditional role trainers’ responsibility, now span across instructional designer, through to instructional developer, trainer, and materials supporter. As an instructional designer, the trainer performs the initial analysis and instructional design tasks. They also include advice on course exercises and revision. As an instructional developer, the trainer writes course materials, exercises, auxiliary materials and develops overheads graphics, exercises, and so forth [3]. Modes of certifying the outcome or the learning process are required. Tests, examinations, quizzes and a host of different
types of assessment methods are used to gauge and sanction the outcome as acceptable or not. While most education/training systems implement and agree that some form of assessment needs to take place, a paradigm shift is presented as to the very essence of assessments. Assess the learning or assess for learning? A dramatic change is happening in the assessment culture. Authors advocate for assessment as a tool for enhancing learning [4, 5, and 6] rather than a simple testing of learning outcome. This redefines the training experience as a project managed by the trainer in his/her role as the major facilitator connecting diverse stake holders. The student is one of the key stakeholders in the whole process and no actual training/learning is likely to happen without his/her involvement. It suits at this point to redefine the student’s role in the updated setup.

3. ONLINE LEARNER AND TRAINING RESOURCES
As the training environment evolves, the traditional classroom contact is no longer the only and prime point of delivery. In distant/online learning environments, the trainer has less direct and sometimes nearly no real time interaction with the student. That makes it difficult to address issues where spontaneous classroom feedback would be of very much added value. In a classroom, the trainer can interact with students through a set of input/response sets that would at least serve an indication to whether the topic under discussion is accessible and understandable to students or not. Facial and body languages are part of the communication protocol and can facilitate the interaction particularly in small groups. Short improvised activities or spot assignments provide real time feedback and prompt an indication to grey areas where more emphasis might be required. Lack of involvement and/or motivation is likely to be addressed timely, making it easier to reach the learning objectives. The situation is completely different with out-sight students whose challenges are not discerned unless effective channels of communication are open and functioning. Students’ attitude towards the training, the media of delivery (technology) their self motivation is of prime importance. Several researchers have identified individual characteristics that seem to describe a successful online student. Gibson [7] found that it is critical for distance students to be focused, better time managers, and able to work both independently and as group members, depending on the delivery mode and location of the distance course. Other studies suggested strong self-motivation, self-discipline, independence, and assertiveness as important characteristics of online students [8]. While, the onus seems to be entirely on the student to address their working discipline and attitude, the content and context need to be provided in a manner that will be conducive enough for effective delivery of the content. Clark [9] addresses the latter through multimedia, contiguity and modality principles. The multimedia principle suggests the use of graphics such as line drawings, charts, and photographs and motion graphics such as animation and video. Graphics need to be congruent with the learning content and add value to the learning content rather than overload and distract. Clark points out a common violation of the contiguity principle encountered in screen scrolling. Displaying graphics close or next to related text allows a better descriptive effect than seeing the graphics first and having to scroll further down for descriptive text of vice-versa. Learning occurs in individuals by way of working memory which is the active part of our memory system. Working memory capacity is needed for learning to occur. Learning becomes depressed when working memory becomes overloaded. If words and the visuals they describe are separated from each other, the learner needs to expend extra cognitive resources to integrate them. Contiguous display of visuals and words achieves the integration for students, leaving their focus to the learning content [10]. Audio inserts are praised for adding extra value to online materials and improves the learning experience as suggested by the modality principle [9].

4. TARGET GROUP
Two major groups of student were sampled for this study, fulltime and part-time working student all registered for Introductory Applied Mechanics. A blended delivery mode made of online resources and face-to-face delivery of class content was applied. Groups were subdivided as follows: groups 1 and 2 were made up part-time student combining study and work whereas groups 3 and 4 were made up of fulltime students. All groups had real time class presentations. Group 2 however, attended real time class simultaneously with group 1 but from a different location, from a different province in the country via video conference. Groups 1, 2 and 3 were exposed to online resources and group 4 had no online exposure at all. Students in groups 1 and 2 freely chose to take their employer’s offer to study and upgrade their qualification for a better position on the corporate ladder with the same employer after graduation. It was assumed for the purpose of this investigation that they all had a clear vision of the deliverable expected after the training, thus motivation and attitude towards the training were not considered to be a major concern. The same assumption was applied to groups 3 and 4, though most fulltime students were much younger compared to candidates in groups 1 and 2 and would show some lack of maturity as for their motivation to complete their academic programme. However, in a country where inequalities from the past are being redressed and a strong emphasis put on the benefit of education, the study was conducted under the assumption that fulltime students should also be motivated enough, with the right attitude to drive their success.

While the attitude towards the training might have not been a problem, the attitude towards the media of delivery might on the contrary have been a cause for concern. The digital divide is still a challenge for many today, especially as long as basic life can be conducted without much to do with computer devices. That is still true for a great deal of communities in Africa. Some students would still be intimidated in using computer. Our role was to create, foster and work as facilitator to make the platform operational in the most possibly optimal way.

5. BLENDED LEARNING: STUDY CASE
Students were introduced to theoretical concepts as well as respective practical aspects and implementations through normal, traditional face-to-face contact classes. A set of worked examples and tutorial activities were introduced. After a topic had been discussed during contact sessions, groups 1, 2 and 3 students would be offered the opportunity to revisit the content material and attempt tutorials online. Selected worked examples and additional tutorials were expanded in a way to dissuade students from regurgitating repetitious memorised routines and rather highlight fundamentals as well as the underlying theory. The process was facilitated through the Moodle (Modular Object-Oriented Dynamic Learning Environment) Course Management System.

The user friendly Moodle environment has been investigated as potential piece of the support system to address the shortfalls and enhance delivery of the teaching and improve the learning experience for large groups. The interface is easy to learn for both the student and the teacher/lecturer. Basic keyboard, typing
A powerful learning environment is characterized by a good balance between discovery learning and personal exploration, on the one hand, and systematic instruction and guidance, on the other [11]. The activity functionality in Moodle was used to make that powerful learning environment possible. Use was made of embedded questions, which accommodate calculated and worded/phrased results as well as multiple choices in a single question format. Graphs/pictures could be added as required in most engineering problems and care was taken to format the graphs and descriptive pictures as recommended by the contiguity principle [9, 10]. Questions were designed to allow students to discuss theoretical contents that might have seemed not straightforward to discern through class presentations. Students were hence led to learn to appreciate working from fundamentals and check the way they approached problems against the backdrop theoretical essence, rather than just do meaningless engineering calculations.

Student would be allowed to attempt a tutorial activity with immediate feedback. Moodle questions can be programmed for automatic grading, allowing one to see cross and check marks showing successful and erroneous attempts. The feature was pointed out to students as an opportunity to engage into constructive debates and discussions. Cross (erroneous results) marks would foster the platform for students to revisit their fundamentals and theoretical contents rather than engage in a blind chasing of the satisfaction of check marks. A particular emphasis was placed to prevent students from the temptation of playing guesses especially in the cases where a feedback provided expected answers. It is common practice in situations where textbook provide final expected answers that students target answers instead of discussing their way to correct results and end-up missing out on the learning opportunity. Subsequent attempts could be allowed for student to check the outcome after their revisit on fundamentals, through additional readings, discussions with peers as well as consultation with the lecturer. Learning was expected to blossom out of the described iteration process.

6. CONCLUSION

This paper was intended to discuss the interim results of an observation being conducted on relevance of the effective use of other teaching and learning modes afforded by technology, in the particular case of handling big class groups. A comparison of the pass rate between groups of students participating in traditional classrooms (group 4) and those exposed to the blended learning mode that included an online component. Admission to the final examination, at the end of a study term is not automatic. Students are exposed to a set of tests and need to pass them to earn their admission to the final exam. The pass rate is calculated as the ratio of students passing out of the total admitted into the final exam. The following observations were made after the second semester 2009: 43 % of group 1 students were allowed to write the final exam and 91 % were allowed from group 2. Groups 1 and 2 produced 100% pass rate. 30% of students from group 3 qualified to write their final exam, while group 4 allowed 37 % of its population into the exam. However, 75% of group 3 students allowed into the final exam passed whereas 61% passed from group 4. It seems to transpire that students exposed to online content (groups 1, 2 and 3) beside normal contact classes seem relatively better prepared. Results from previous observations showed 31% of the population was exposed to additional online support and could generate 53% of the overall pass rate on the sampled class population. The result is even more interesting for group 2 that joined classes through video conference, where students had no physical contact at all. The speculation is to whether the lack of physical contact with the lecturer spurred them into more personal initiative, better time management and effective use of all resources made available online. More observations are still being conducted before significant conclusions could be validly drawn and set as an indication for conducting big population classes.

7. REFERENCES