Teaching Advancement at University (TAU) Fellowships Programme

Title: An Exploration of e-learning practices to the first year Mathematics students at Mangosuthu University of Technology

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Abstract

Institutions of Higher Education in South Africa, are generally not doing their best to provide an effective, flexible, convenient and accessible learning experiences to cater for the 21st century students enrolling in the universities of technologies. In the teaching of mathematics, we find a lot of misconceptions from students which are as a result of problems from the basic education level that have occurred over a period of twelve years. The purpose of this study was to determine the impact of e-learning to mathematics first year students with the focus on the underlying principles in understanding mathematics and how students will use technology platform in learning the subject. The study utilised a mixed methods approach with the qualitative data being used to interpret and make sense of the quantitative data. Data were generated from student previous examination paper, pre-test, post-test, questionnaires and focus group interviews. The findings revealed that success rates differed by gender and with most of the female first year students being unable to use technology platform effectively. The study recommends that Institutions of Higher Education (HEIs) that offer extended curriculum programmes (foundation) should take greater care in designing their calendars, so that it alleviates instead of tightening the constraints under which students work. Greater support to at-risk students in the form of e-learning platform is required, which could include the option of extending the programme delivery over a year than a semester.

Introduction

The lack of preparation for HE of South Africa students when they join the Higher Education sector in particular, the faculty of engineering in a University of Technology, is still unacceptable. This is a situation which was expected to have been addressed by democracy. As a country, we still find a recognizable number of students dropping out from universities. The under preparedness is one of many contributing reasons for this scenario. It eventually impact's the country's pursuit of both improved economic and social development due to the low graduation rates mainly in, Sciences, Technology, Engineering and Mathematics. However, a number of changes in the teaching and learning of mathematics in the recent years has taken place. The key changes that are still having considerable influence in the classrooms are the increase in student intake at the university level doing mathematics as one of his/her major subject. In teaching mathematics, we find a lot of content related misconceptions from students which are as a result of major pedagogical and curriculum changes from the basic education level that

have occurred over a period of twelve years (Ryan *et al*., 2001, Alexander, 2001). Students find it difficult to cope with the main stream education system, irrespective of their basic education standard. This is due to the fact that students are encumbered with social, community and personal complexities for which they have not been fully prepared at the basic education level. Consequently, many students do not proceed beyond the first year of study and even those that do, stay in the system beyond the minimum regulation time. This project explores e-learning practices to the first year Mathematics students at Mangosuthu University of Technology (MUT). It is in the first year level that the underpinning foundations for a sense of belonging, student engagement and an understanding of the demands of university study culture, are built. This is the crucial period for the first entry university students since, it impacts on their future educational progress, retention and success.

Literature Review

Research studies by (De George-Walker & Keeffe 2010) indicate that there may be changes in students' performance in mathematics if technology can be embedded in the teaching and learning in and out of the classroom. This is reflected when students display technology-influenced aptitude, positive attitudes, beliefs and sensitivities (Oblinger 2003). Roberts, (2005) suggest that universities could investigate technology broadly so that it can be possible to increase the student's interest and ability to adapt technology to meet their individual needs. The introduction of information and communication technology (ICT) in the teaching and learning as supported by (Conole et al. 2004), is proposed to be effective if it can be combined with face-to face teaching activities that will promote learning collaborations amongst students. Brophy (2001) and Salmon (2000) confirms that there are benefits for the students in using ICT.

Studies conducted by (CHE, 2013), have indicated that graduation output of Higher Education students, does not meet the country's demands. The studies also indicate high failure and dropout rate. A pronounced cohort study by (Scott, Yeld and Henry, 2007) still indicate the major challenges in the South African Higher Education even after democracy where by a number of various mitigation efforts in the sector have been introduced and monitored. There is still less than half of the 18% (20-24 age group) grade 12 students who join Higher Education sector and complete their studies in regulation time. A significant number of first time entering students (30%) drop out in year one. The Council on Higher Education (CHE, 2013) conducted recent cohort studies which included all Universities of Technology in South Africa. The findings, combined with Scott, Yeld and

Hendry (2007) study, indicate a uneasy picture. The national rate of student persistence and graduation has shown undesirably change over the past decade (CHE: 2011). Universities of Technology are performing equally poorly.

Research Questions

As a developed research field, mathematics education is still a major field of study since students' present different forms of subject content difficulties in learning the subject mathematics. Currently, the adoption of technology by students and lectures is still a debate in every mathematics classroom. The research project is particularly interested in the following questions: 1) In what ways can teaching change to take into account the different background, abilities and interests of the first year mathematics students at MUT? 2) How can e-learning practices be an effective method for teaching and learning to the first year mathematics classroom for subject knowledge to be enhanced? The aim of the research project is to investigate the student's challenges of mathematics content areas for the first year students at MUT and develop a strategy that can be used to address them. The major objective is to determine whether or not e-learning platform can enhance first year students' teaching and learning of mathematics at MUT.

Methodology

Design-based research known as iterative research process introduced by Reeves (2006) was used in the project. It was considered in the study so that it could be used to integrate new design principles with current technologies to improve mathematical solutions to students' challenges. It was also considered in managing the intervention programme that can result to improve and classify new design principles.

The intervention was in the form of study material, you tube videos, previous tests, previous examinations papers, most relevant internet websites posted into black board as the university learning management system. There was a need to review the students' timetable so that we could have enough time for the intervention to yield good results. The intervention was done in the period of three months with students. Students had 3hours to spend on each week in the computer laboratory and 4 hours for lecturing and class discussion. Students were also encourage to visit the library for sourcing relevant knowledge on the sections covered in class. Through the library visits, it became clear that students do not know how they go about looking for the books in the shelves, they lacked information such as how to look for the books using the library computers. This lead to

calling the library assistant to give students training on how should they go about when looking for any or specific textbook in the shelves.

Recommendations for the university to improved teaching and learning of first year students

The results of the research showed that the period of six months is not enough to introduce any meaningful intervention strategy and yield a desired outcome. There should be a curriculum restructuring for the mathematics module so that it can include, computer skills, learning skills, study skills and use of technology in the learning of mathematics. Students agreed that technology should be considered for learning mathematics but a training is necessary to train them how to use it effectively. The blackboard leaning management system for the institution was reported by students to be a failure for them since they were always struggling to login and the internet connectivity was mentioned to be a serious problem that need to be attended too, so that learning resources could be available to students at any time.

The number of periods dedicated for mathematics in a week did not include the tutorial slots, which means that students are left on their own after the class delivery. This is a serious problem to the first year students, because they have not yet matured to learn on their own. Subject such as mathematics in nature, requires discussion, face to face and most importantly an opportunity for students to consult as individuals. Students indicated that it would be advisable to introduce small tests that could be done using online platform. These tests will make them engage with the subject more meaningful. The fact that the programme is offered in the evening, it also had a negative impact in the sense that most students found it uncomfortable to learn in the evening since they had to take train, taxi and bus back home.

The library accessibility was reported to be challenge to students. There is a need to improve the library induction period for first year students so that they can be able to understand how to get a book in the library, how to reference for the assignment and how to access university library when students are off campus. This necessitate the proper training on the use of computer to search for books until there are confident enough to use it on their own. If this can be achieved by students, it would ultimately help them understand how to search for learning materials for their studies.

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