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Preface

The swift advancement of technology in the 21st century is leading to remarkable shift in how we do things particularly among the youth. The ways in which 21st century learners tackle problems create a drastically different picture from the ways in which learners of past centuries approached problems.

The reality of the evolving educational landscape of the 21st century calls for academics, researchers, curriculum developers, policymakers and designers of educational technologies to regularly share ideas in order to learn from each other and be able to enact policies, develop, adopt and support the use of technologies that will empower the 21st century learners.

The South Africa International Conference on Educational Technologies (SAICET) is a scientific forum for policymakers, academics and researchers to network and presents a wide range of perspectives to address issues relating to educational technologies.

This is the third edition of the conference. Since the first edition in 2015 we have received proposal from over 20 countries. This is a testimonial to the wide range of the nature and contexts of the presentations and the crossbreeding of ideas at the conference.

We welcome all participants to Pretoria and especially the international participants who may be visiting South Africa for the first time. We are most delighted to have all of you here to participate in the conference. SAICET will continue to be an annual event, so we look forward to seeing you and many other participants next year at SAICET 2018.

We specially thank the keynote speaker, the workshop presenters, the reviewers of the full papers, and the editors of proceedings who have worked diligently to make the conference a success.

Prof A. Mji
Conference Chair

List of Reviewers

The organising committee of SAICET 2017 would like to greatly thank the following reviewers who took the pains to review the conference papers.

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Review Process

In total, 70 manuscripts in different areas within the field of Educational technology were received. Of these manuscripts, 31 were intended to be full papers while the rest were to be short papers. All the full manuscripts were subjected to a double blind review. The reviews were carried out by experts from different countries. Their brief was to base their reviews on 21 criteria they were supplied with. They were also requested to look at the manuscripts with the aim of assisting authors to produce good quality presentations.

Following the review process, the editorial committee considered the reviewers' comments and 11 manuscripts were found to be unsuitable for publication. Reports were forwarded to the remaining 20 authors with suggestions of what needed to be addressed. After receiving the re-worked manuscripts, the editorial committee finally accepted 17 for inclusion in the proceedings. This means that the acceptance rate was just about 55%.

Editors

U. I. Ogbonnaya
S. Simelane-Mnisi

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CAN THE SELF, THEM OR/AND IT COME TO ACADEMICS' RESCUE OF TURNITIN?

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Abstract

Turnitin is widely available as an important assessment resource used by academic institutions to reduce plagiarism. Plagiarism has become a worldwide challenge for academic institutions which resulted in the introduction of Turnitin to support academics in the assessment of dissertations/theses. Nonetheless, the majority of academics do not adhere to optimal benefits associated with Turnitin in assessment. It is believed that psychological spaces (self, societal and professional) play an important role in academics' individual ability to undertake the usage of Turnitin. The purpose/objective of this article is to explore/understand the psychological spaces used by academics in the assessment of postgraduate theses/dissertations supported by Turnitin at a South African university. Recognising and understanding psychological spaces may allow the university to better support academics in the usage of Turnitin as part of their assessment resources in order to educate students about plagiarism. This study used reflective journal and one-on-one semi-structured interviews for data generation/production. The findings for this study suggest that the academics' usage of Turnitin in assessment was driven by self and societal spaces more than professional space. This study consequently recommends alignment between the self, societal and professional spaces to drive the academics' usage of Turnitin to support assessment of theses/dissertations.

Keywords: Assessment, professional, self, societal, space, Turnitin

Introduction

Plagiarism has become a worldwide challenge for academic institutions which resulted in the introduction of Turnitin to support academics in the assessment of dissertations/theses. Turnitin is widely available as an important digital technology (DT) assessment resource used by academic institutions to reduce plagiarism (Khoza, 2015a; Rolfe, 2011). A DT resource is defined as "anything that facilitates/initiates learning or any person or thing that communicates learning" (Khoza, 2015a, p. 1). A study conducted by Ozbek (2016) on university professors or teachers who were using Turnitin in applying formative assessments to provide feedbacks to students, supports the three types of resources which were identified by Khoza (2015a). The study supports the HW (any tool/machine/object used in education), SW (any material used in conjunction with tools to carry/display information) and psychological spaces (PS) (things that we cannot see and touch in education such as theories and ideologies). According to Khoza (2016a), PS should drive any assessment in education because learning is not about technology (HW or SW resources) but is instead about the psychology behind the learning (PS) (Khoza, 2016b; Mishra & Koehler, 2006). This suggests

that assessors (academics) should first understand relevant PS resources that underpin their assessment before the usage of Turnitin occurs. Therefore, the academics need to formulate or identify a psychology (space) for using Turnitin as a deterrent in order to help students to learn in the process. In other words Turnitin should be demanded by the educational vision, goals or content according to formulated or identified PS (Khoza, 2016b; Ngubane-Mokiwa & Khoza, 2016).

It becomes easy for higher education institution students to plagiarise if they were not trained at high school level to avoid plagiarism (Khoza, 2015a; Mpungose, 2016). This suggests the importance of higher education institutional processes that support academics' initiatives that appeal for help which will in turn develop students when they are still new at university. While Turnitin is becoming a necessary solution, it is itself not different from other technologies that have contributed to the division between academics and students that resulted in new concepts that seem to discriminate against academics from students' activities. This division between the academics' and students' usage of Turnitin (HW or SW resources) has started a new, important, on-going discussion in education (Goddard & Rudzki, 2005; Govender & Khoza, 2017; Ozbek, 2016). The on-going discussion divides the use of Turnitin into self (personal identity), societal (society or them) and professional (thing or it) psychological spaces (Foucault, 2007; Khoza, 2016a; Mezirow, 2000).

Turnitin

According to Khoza (2015a) plagiarism problems led to the development of the Turnitin program by John M. Barrie when he was a graduate student at the University of California (Berkeley) (Ison, 2012, 2014). By the year 2006, Turnitin was used by about 6,000 academic institutions and 60,000 students' assignments were uploaded into the database daily (Glod, 2006). This suggests the importance of Turnitin in helping academics and students become aware of issues of plagiarism as witnessed by the following studies:

A study conducted by Macdonald and Carroll (2006) on the approach to plagiarism suggests a holistic approach with three main principles to be used as a framework for Turnitin usage. The principles indicate that: (1) it is important that students and academics receive the appropriate information and develop the necessary knowledge with skills (self-space); (2) assessment design is such that plagiarism is reduced (societal space); and (3) the usage of the program has appropriate policies, procedures and guidelines in place to deal with any issues that arise (professional space). When these principles were used by Rees and Emerson (2009) in a case study that explored the extent to which the use of Turnitin transformed assessment practice (promoted academic integrity) at Massey University, it did not transform all the students although it was useful. This suggests that there is a need for a clear and coherent psychological spaces (framework) for the usage of Turnitin by academics.

While there seems to be many studies conducted on Turnitin, these studies recommend further investigation in order "to understand how to use the self-service approach more effectively to improve referencing and citation, and narrow the gap between students

expectations and university standards” (Rolfe, 2011, p. 701). Other studies recommend an investigation that aims to understand how to use technology to avoid plagiarism by educating to avoid, instead of detecting to punish (Bensal, Miraflores, & Tan, 2014; Czerniewicz & Brown, 2014; Khoza, 2015b). Therefore, the recommendations of the aforementioned studies should be able to help academics to become aware of and avoid the major weaknesses posed by Turnitin. Some of these weaknesses include that Turnitin is unable to distinguish between different referencing styles such as American Psychological Association (APA), Harvard style and others in checking uploaded documents or files (Khoza, 2015a). According to Bensal et al. (2014:12), “when comparing the software feedback and the teacher’s feedback of the argumentative essay drafts...” one may easily identify comments from the teacher that were not asked or questioned by the software. However, in South Africa none of the studies on Turnitin was conducted within the critical paradigm with action research. The critical paradigm aims at transforming academics in order to improve their Turnitin integration process (Esau, 2017; Govender & Khoza, 2017; Khoza, 2015b). Therefore, this suggests the need for a study conducted in the critical paradigm using action research because it promotes reflective teachers.

Research Purpose/Objective and Research Question

This article intended to explore and explain academics’ psychological spaces on the use of Turnitin in their assessment processes. From the academics’ psychological spaces the following two research question were answered:

- What psychological spaces do academics use to underpin the usage of Turnitin at a South African university?

Research Design and Methodology

This is a critical action research study of six academics at a South African university. The main purpose of the critical paradigm is to interrogate the phenomenon which in turn may transform the participants (Lisle, 2010). Action research deals with a specific context, which may not represent the whole population, with an aim to create a reliable generalisation (Esau, 2017). However, transferability remains a possibility. Action research is subjective but in-depth, open-ended, exploratory and transformative in nature; it is conducted on entities in their natural settings where teachers research their practices with the aim of improving their teaching situation (McNiff, 2013; Ramathan, 2017). A combination of the critical paradigm and action research is important for this study because it is transformable, holistic, explorative and contextual in its nature (Esau, 2017; McAteer, 2013; McNiff & Whitehead, 2009). The study used a critical action research process in order to help the participants to learn to plan, implement, observe and reflect on their practices in order to improve their practices (McAteer, 2013; McNiff, 2013). The data were generated from the reflection stage as the final stage of action research. However, Hakim (2000) asserts that this process is not suitable in education because it may take place even without following a scientific research process and be influenced by opinions rather than facts. Nonetheless, this study combined the action research with critical paradigm to overcome the above weakness (Lisle, 2010; Ramathan, 2017).

Sampling

Purposive sampling was used in selecting the only six academics who used Turnitin as part of their assessment processes at a South African university. The participants had to answer the research question through reflective journal, and one-on-one semi-structured interviews. Purposive sampling is useful for selecting a specific group with specific unique qualities (Esau, 2017; Ramrathan, 2017). The six academics were working as a team to supervise Master of Education (MED) and Doctor of Philosophy (PhD) students. The six academics used Turnitin to educate MED and PhD students to avoid plagiarism. The names were not revealed because of ethical considerations, as suggested by Cohen, Manion, and Morrison (2011) and Creswell (2014). Informed consent and ethical clearance were acquired and obtained in terms of confidentiality, voluntary participation, and withdrawal whenever they felt the need. Issues of benefit and anonymity were also discussed with the participants. The ethical clearance certificate was obtained from the local ethical guidance committee of the university.

Data Production/Generation and Analysis Methods

Methods used in this study for data generation/production were reflective journal, and one-on-one semi-structured interviews. The participants kept reflective journal which they generated and used during their supervision sessions when they used Turnitin to provide formative feedback to their students. Thirty minute interviews with each of the participants were conducted twice within which the participants were asked to reflect, through writing, on their use of Turnitin. The different questions asked: for example, how long have you been using Turnitin? (self-space); who advised/guided you to use Turnitin? (societal); what books/studies/content do you read on the use of Turnitin? (professional); and sub-questions for probing were also used (Khoza, 2015a). The interviews were used to add some sub-questions in order to probe for more data and rephrase the questions where necessary in order to accommodate those participants with a tendency to avoid certain questions (Khoza, 2016a).

Multiple sources of data were used for the purpose of enhancing authenticity of data and achieving measures of trustworthiness (Khoza, 2015a). An audio-tape was used to record the interviews for ease of transcription. Therefore, the five processes of trustworthiness were involved and observed in this study (triangulation, transferability, dependability, confirmability and credibility) (Ozerbas & Ucar, 2014).

In terms of data analysis, this study used inductive analysis where two themes and categories emerged from the data and literature (Table 1). The codes used for data analysis in theme one were self-space (driven by one's experiences), societal space (driven by people's advices/instructions) and content/professional space (reason driven by reading different sources) (Khoza, 2015a). Theme two identified aims, objectives and outcomes.

Findings

Table 1 presents the findings framed by two themes and categories in order to simplify them for the readers.

Table 1 Findings (Themes and Categories)

Theme	Propositions
Self-space	Personal or habitual actions
Professional space	Factual actions
Societal space	Opinion driven actions

Themes (what psychological spaces do academics use to underpin the usage of Turnitin?)

According to the findings from the academics' responses, the academics' spaces for the use of Turnitin are categorised into self-space, societal space and professional space as presented in Table 1 and are discussed below.

Theme one: Self-space (personal or habitual actions)

Self-space for using Turnitin in assessment of theses is the psychological space (vision/rationale/reasons) for assessment that puts individual academics at the centre of the assessment environment (Khoza, 2015a). The main part of this space is to create a well-resourced environment that helps academics to construct their own unique individual identities. When academics create this supportive environment they include experiential and subjective activities that support students in order to construct and reconstruct knowledge repeatedly and, hence, take the form of personal meaning. According to Schiro (2013) personal meanings make up the knowledge that is unique to each individual that possesses it and holds personal significance to each person since the particular environmental context in which it is assimilated or constructed is a result of experiences in a particular assessment environment at a particular time. As a result knowledge is viewed as a basic part of assessment because it is not a separate entity that has to be learned from outside the individual academic.

Participants used Turnitin to check their students' theses and started to enjoy it. After these participants used Turnitin for their students' theses they decided to make it compulsory for all their students' theses.

'I was not aware of Turnitin until I had to use it for my students' theses, although it was difficult at first when I saw the percentage that was more than 0% because I thought that my students were perfect in academic writing ... but Turnitin proved me wrong and I start to be extra careful and strict to them...' (Participant 2 and others agreed). Participant 4 - *'I enjoy working with computers but I was not aware of this useful programme which has helped my students to avoid plagiarism ... I have been helping my students by making sure that they are familiar with most of the university application software while they are conducting their studies...'* Participant 1 – *'Although I do not have advanced computer skills I found that Turnitin is easy for...anyone can use it if one is given the correct steps...'* *'We*

are lucky that our university is very supportive, as a result we had to work as a team of six academics in order to improve our knowledge and skills in working with students who are good in using technology... Tertiary education involves searching for information in order to write assessment tasks or assignments where Turnitin is becoming an excellent tool to check any plagiarised element...' (Participant 6).

The above accounts suggest that the participants used Turnitin for self-spaces because they started by using it for their students' theses or dissertations (they were at the centre of Turnitin activities as students). Therefore, it appears that when they tried to use Turnitin to prepare their students to avoid plagiarism, they were still at the centre of the Turnitin activities that helped them to find their Turnitin identity (psychological self-space). This suggests that the participants had a higher level of awareness about Turnitin and its capabilities.

Theme two: Professional spaces (factual actions)

Professional space is defined as a psychological process for assessment that places the profession at the centre of the Turnitin performance curriculum (Khoza, 2016b). This assessment space is called performance, collection, or vertical curriculum (Bernstein, 1999). This suggests that one uses Turnitin because one is influenced by reading different sources that develop one's cognitive domain. The Cognitive domain is used to decide whether Turnitin is successful or not within a specific profession or subject. In a performance curriculum each subject stands on its own and has its own collection of terminologies and concepts. It is driven by identified content where all teachers teach and students learn the same body of knowledge from the lowest to the highest levels.

'We have been using Turnitin to check students' projects if they have not plagiarised ... no we do not use it for other things other than originality ... maybe we shall use other tools like marking tools in future but for now it is working well with the originality tool ...' (Participant 5 and others agreed). *'...we designed an information book on plagiarism which has procedures for all PhD and MED thesis and dissertation submissions to Turnitin where all submissions that exceed 10% had to be corrected and re-submitted to Turnitin ... those who exceeded 10% in their second submissions were given more support to show them how they should avoid plagiarism over and above the two workshops that were organised to give all our PhD and MED students formal information on plagiarism ... As a result we used this information book to develop our policy and procedure over and above the university policy... we are preparing them for academic writing and promote academic honesty and integrity...'* (Participant 1 and others agreed). *'Sometimes other students write some documents on general knowledge and submit them to Turnitin to record 0% and make sure that they do not submit the real projects to Turnitin but submit the short screen report to us...'* (Participant 4).

These findings suggest that the professional space was limited in driving the participants to use Turnitin. None of them were able to read studies on the importance of using Turnitin in assessment. Even the information book which was used to develop policy and procedure was not specific to any subject or discipline in order to reflect the professional space which is

about factual actions (Khoza, 2016a; le Grange, 2016). It was clear that the participants did not read studies or sources on the use of Turnitin to help students to avoid plagiarism because they had a misconception of 10% as a maximum percentage to guide learners (Kiriakidis, 2013) (Khoza, 2015a; Kiriakidis, 2013). The 10% is a misconception that mostly affects those who do not use Turnitin for professional space because students may have even 1% seriously plagiarised work. On the other hand one may even have 20%, but when checked only to find that one has 0% plagiarism and the 20% reflects the used template or standard cover pages.

Theme three: Societal spaces (opinion driven actions)

Societal space places society at the centre of assessment environment (Khoza, 2016b; Schiro, 2013). This assessment environment is called a competence (integrated or horizontal) curriculum (Bernstein, 1999; Hoadley & Jansen, 2014). In a competence curriculum, subjects are combined to form a learning area. Achievement of observable or measurable outcomes is the major practice in this type of curriculum. Levels of outcomes (lower, middle or higher order) are not important but the most important element is the achievement of outcomes which becomes an end in itself (du Preez & Reddy, 2014; Khoza, 2016b; le Grange & Reddy, 2017). As a result, it is mostly influenced by opinions, local everyday or general knowledge and oral conversation. In this type of curriculum, knowledge is mostly generated horizontally from simple sources or local known sources (Berkvens, van den Akker, & Brugman, 2014; Hoadley & Jansen, 2014). Assessment is mostly about what is present or what the students (students) have achieved, not what the students should have achieved based on international standards. In other words students are compared to one another for achievement.

‘We believe that Turnitin promotes integrity, therefore we are trying to encourage all our colleagues to use Turnitin because we want our students to lead ... and we are aware that technology is here to stay and we want to take advantage of all useful technologies that help our students...’ (Participant 4 and others agreed). Participant 2 said *‘we have started to introduce our colleagues to Turnitin ... but we limit it to MED and PhD because we have 300 MED and PhD students....’*

The above accounts suggest that the societal space was one of the two dominating spaces (with self) because the participants used Turnitin to introduce it to their colleagues. Over and above being encouraged by teaching their colleagues, they were also encouraged by the fact that they wanted to lead other supervisors in using Turnitin to promote academic honesty and integrity.

Discussion of Findings

The findings appear to suggest that Turnitin is promoted by academics’ reflections on their personal everyday experience and societal reasons. The findings suggest ‘Assessment, Educating to avoid and Turnitin’ (AEtaT) framework and as suggested by (Khoza, 2015a).

The integration process started with teaching/learning signal (T/LS) (assessment) followed by IW (educating to avoid) and then SW (Turnitin).

In assessing students for attained goals, formative and summative assessments were important for these academics because they helped them to assess students with an aim to educate them to avoid plagiarism. Formative assessment (assessment for learning) is part of learning when students are assessed for their collection of relevant information (Khoza, 2015b; le Grange, 2016). This indicates to academics where their support is required without necessarily grading students (it usually takes place during the teaching/learning processes). The academics achieved this by allowing their students to do peer assessment before summative assessment. Summative assessment (assessment of learning) is a summary of formative assessment of their students' achievements of goals (outcomes) where academics are grading their students (Hyland, Kennedy, & Ryan, 2006; Khoza, 2015a).

Hyland et al. (2006), indicate that if assessment strategies are used for continuous assessment, the process becomes a collection of different sets of summative assessment used in generating marks for grading students without any formative assessment element that helps the students with feedback (Khoza, 2015b; le Grange, 2017). Ramsden (2003) indicates that assessment takes place at the end of teaching and learning processes for academics while it takes place at the beginning of the teaching and learning processes for students. This means students are being tested by anything that is given to them while their teachers are sometimes not aware of this situation (Francis & Le Roux, 2011; Khoza, 2015b). Formative assessment or assessment for learning was used as the assessment process that identified 'educating to avoid' as the psychological space (PS) resources in order to focus and become aware of the relevant HW/SW resource (Turnitin).

The participants should be aware of what constitutes assessment as well as approaches that identified Turnitin as the relevant SW resource. Awareness goes with school/scientific knowledge. This suggests that the AEtaT framework consists of Formative assessment, HW (computer), SW - Turnitin and PS (educating to avoid) resources that transform both academics and students if they believe in school or scientific knowledge. Scientific knowledge is about using present situations to create what one needs for the future (Khoza, 2016a). One becomes aware of past, present and future activities and treats them accordingly (Khoza, 2015b). According to Hoadley and Jansen (2014), scientific knowledge is about identifying the absence, where one has to always look for what is still missing in the teaching/learning environment in order to move to the next level or improve the situation (future investment).

Conclusion

Education Implications

This study concludes that academics should monitor or check all the students' submission before they give marks. Checking should include, but not be limited to, technical errors and evidence of students' claims because Turnitin does not check these. If academics can work

hard to help their students to have facts about Turnitin they can avoid all the major challenges of plagiarism. If academics and students have facts about assessment resources, they tend to treasure them and use them for professional spaces, but if they only have opinions about the resources, they tend to use them for societal spaces. The findings further conclude that the academics' usage of Turnitin in assessment was driven by self and societal spaces more than professional space. This study consequently recommends alignment between the self, societal (society – them) and professional (profession – it) spaces to drive the academics' usage of Turnitin to support assessment of theses/dissertations.

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ASSESSMENT OF COMPUTER-BASED HIERARCHY CONCEPT MAPPING STRATEGY FOR SENIOR SCHOOL CHEMISTRY USING KIRKPATRICK'S EVALUATION MODEL

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Abstract

Chemistry as a very essential subject for human development is eluding present day learners, due to difficulties experienced in learning its content, one of which is poor instructional method. Integration of computer-based concept mapping instruction can help to organize mental functioning in ways not possible outside the electronic medium, which may be a possible panacea to the problem of students' poor performance in chemistry. The study objectives were to: assess the effectiveness of the package on students' performance (Kirkpatrick Evaluation Model - reaction, learning and behaviour) when used for chemistry instruction, considering the interaction effect of students' gender. Sixty nine senior school chemistry students formed the sample to test the effectiveness of the strategy. Two research instruments: chemistry learners' achievement test and chemistry learners' reaction to computer-based hierarchy concept mapping package questionnaire, were used for data collection. The test and questionnaire instruments yielded reliability values of 0.73 and 0.86, using Pearson product moment correlation coefficient statistics. T-test statistics was used to test the research hypotheses. Findings of the study were: that chemistry students reacted positively to the learning strategy as a grand mean of 3.96 was obtained, out of a maximum of 5. There was significant difference in the learning performances of male and female students exposed to hierarchy, $t(31) = 3.979$, $p = 0.001$ and $t(31) = 3.019$, $p = 0.005$, for learning and behaviour performances. The study concluded that the package was effective in enhancing students' performance in chemistry. The implication is that relevant instructional package can enhance students' performance in chemistry. The study recommended that contextually relevant packages should be developed and used for learning chemistry in Nigerian senior schools.

Keywords: Instructional method, Computer-based concept mapping, Kirkpatrick Evaluation Model, Chemistry learners' achievement test, Chemistry learners' reaction.

Introduction

Science is a major component of human society and its cultural, political, socio-economic and technological significance is so fundamental. Obianke (2009) reported that science continues to contribute to human life, especially in areas of medicine, shelter, leisure, communication, security, education, transportation and sports. Ekeh (2003) observed that in all countries of the world, science courses most especially mathematics are given special attention due to numerous gains derived from it. Bello (2000) pointed out that science does not only empower humankind to become the most influential species on earth, it has become

an integral part of human culture. He goes on further to state that it is a global realization that the contribution of science, its application in technology to sustainable development and progress in all spheres of human society are very important.

Nigeria has one of its set goals to be economical and technological advancement, and necessary measures need to be put in place to achieve this. This led to the formulation of the national policy on education (Federal Republic of Nigeria, 2009), which lays more emphasis on the teaching of science education and providing a strong foundation of science from the primary to the tertiary levels.

Chemistry is one of the science subjects taught in Nigerian senior schools. It is the science of matter, especially its chemical reactions, and also its composition, structure and properties. Chemistry is mainly interested in atoms and their interactions with other atoms, and in particular with the attributes of chemical bonds. Chemistry is a crucial science subject learnt at the secondary school level, which has consistently placed a great menace on many learners since its existence. These are ramifications due to its structures of compounds, peculiar nomenclature, mechanism and series of chemical reactions involved, chemical equations and the calculation linked with some concepts and topics. Some concepts are also abstract in nature thereby making their comprehension relatively difficult when compared with some other non-science concepts (Fatokun, 2006).

However, these advantages of chemistry, which are very essential for human development, are eluding the present day learners, because of the difficulties they experience in learning its content. The persistent problems faced by students in the understanding of chemical bonding have been identified by many researchers (Dahindsa & Treagust, 2009; Kind & Kind, 2011). Teichert and Stacy (2002) stated that many studies conducted worldwide revealed that the traditional approach of teaching bonding is problematic. This research is therefore interested in chemistry, as one of the science subjects taught in Nigerian senior schools. Unfortunately, it will be quite difficult to learn advanced chemistry content without an understanding of chemical bonding (Coll & Treagust, 2001; Hilton & Nichols, 2011).

One of the means of enhancing the effectiveness of a teacher and students learning is through the appropriate strategy adopted in a learning situation. One of such strategy is the use of concept mapping technique. Potency in chemistry instructions will facilitate the anticipated change in behaviour and learning among chemistry students. In the process of thinking, concepts are the most important of all the forms of knowledge for they are mental tools of thinking that enable one to understand both the physical and social worlds, as well as to communicate intelligibly.

Concept maps are graphic organizers that assist students in organizing and representing knowledge. The concepts are usually enclosed in circles or boxes and relationship are indicated by a line connecting two concepts. Concept maps comprises of nodes (terms or concepts), and linking lines, usually with an arrow from one concept to another (Lee &

Nelson, 2005; Vanides, Yin, Tomita & Ruiz-Primo, 2005; Yin, Vanides, Ruiz-Primo, Ayala & Shavelson, 2005). In agreement with Ausubel's assimilation theory, which focused on meaningful learning, in which individuals must relate new knowledge to relevant concepts they already know, nodes are ranked and organised by importance, with more broad ideas at the top advancing to the more detailed concepts beneath. The commonest forms of concept maps that can be found are the hierarchical and spider concept maps. This is evident in the definition of Chularut and DeBacker (2004: 249), who proposed that concept mapping, is "a tool for representing the interrelationships among concepts in an integrated, hierarchical manner".

In mapping concepts, computer software programmes are even more adaptable because they allow moving concepts or moving entire groups of concepts to streamline the map. Concept mapping software offers modifications of existing work such as additions, deletions, modifications, or reorganisations. With advances in computer technology, it is believed that the use of computerized concept maps will enhance the effective teaching and understanding of particular topics in chemistry, since the use of computers will provide better interactions than what is obtainable when such concept maps are not computer-based.

Although it is well established in the human resource development community, Kirkpatrick's (2001) four level model is less known in educational evaluation circles because it focused on the evaluation of corporate training programmes. Kirkpatrick proposed four levels that the evaluator must attend to: reaction, learning, behaviour, and results. Reaction refers to the participants' satisfaction with the programme, the typical course evaluation survey measures reaction. Learning is the extent to which participants change attitudes, improve their knowledge, or increase their skills as a result of attending the programme, course exams, tests, or surveys measure this kind of change (Kirkpatrick & Kirkpatrick, 2006). Behaviour measures whether the knowledge, attitudes and skills learned could be transferred to the workplace to reflect positive changes in behaviour and job performance. Results have to do with the effect on the business or environment as a result of the improved performance of participants in a particular programme (Hamtini, 2008). However, only three of the four levels have been used for the purpose of this research, as the fourth level is usually evaluated on a long-term basis that will extend beyond the period meant for this research. Gender is a major factor that influences career choice, subject interest and academic performance as well as achievement of students in science subjects.

This study therefore employed Kirkpatrick's three of the four-level evaluation model to explore computer-based hierarchy concept mapping strategy for senior school chemistry, using the interaction effects of gender.

Theoretical Basis for the Study

Instructional design models are a representation of a view on how people learn. It is also the guideline by which an instructional designer creates instruction. Models help us conceptualize a system or process. They simplify the complexities found in real situations

into sets of generic steps that can be applied in many contexts (Gustafson & Branch, 2002). The most suitable for the design of instructional strategies like the computer-based concept map instructional strategies designed here in this study however, is the Seels and Glasgow model which is product-oriented. The Seels and Glasgow model contain the five ADDIE components: analysis, design, development, implementation, and evaluation.

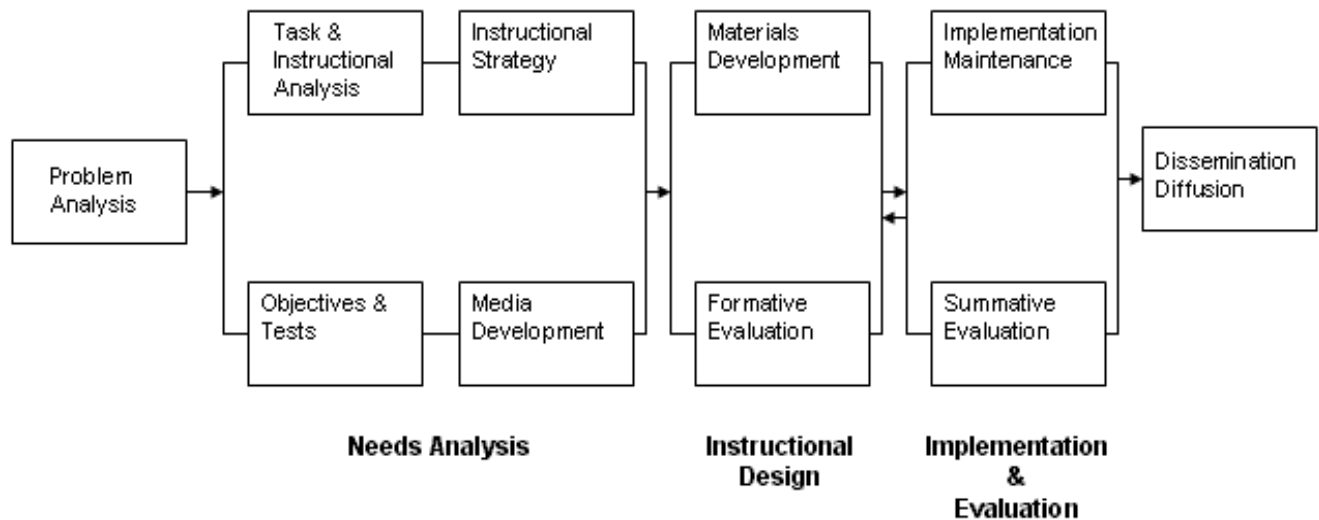


Figure 1: Seels and Glasgow model product-oriented model (Prester, 2002)

As can be seen in figure 1, the Seels and Glasgow model consists of three phases: needs analysis, instructional design, implementation and evaluation. This division allows a project to be designed, resourced, and managed as three phases. Prester (2002) explains that the Seels and Glasgow model leads to efficiency in project planning, resource allocation, and control of the development cycle of the product while recognizing that instructional designers are often asked to either manage a project or work within the context of an already established project management framework.

The first phase, need analysis, includes the establishment of the instructional goals, context and requirements. In the second phase, instructional design begins after phase one is completed and is made up of six steps namely: task analysis; instructional analysis; objectives and tests; formative evaluation, materials development, instructional strategy and delivery systems all of which are connected by interaction and feedback. The third phase in which implementation and evaluation take place, involves development and production of materials, training delivery and summative evaluation. The steps and phases in this model can be applied in a linear fashion but they are often applied iteratively. Gustafson and Branch (2002) in particular stated that, the steps in the instructional design phase depends on one another, are simultaneous may require iterative cycling.

Regarding the evaluation of the learning strategy, even though Kirkpatrick's evaluation model is focused on training programme evaluation, the model is still relevant to general educational settings, for example, this is in consonance with the work of Guskey (2000) in which teacher professional development programmes were evaluated. Four levels of evaluation are comprised in this model namely: Level 1, which finds out the reaction, Level 2 that measures learning, Level 3 which assesses behaviour, and Level 4-Results. Kirkpatrick & Kirkpatrick (2006) stated that, each level is important and has an impact on the succeeding level. The process becomes more complex and time consuming as the assessor proceeds from one level to the next. As such, not many organisations manage to measure beyond level 2. For example, as reported by the American Society for Training and Development (ASTD) in the year 2003, ASTD reported in its state of industry report, a survey of 276 organisations reports that most organisations have collected reaction measures, more collected learning measures, less job behaviour measures and the least collected business impact measures (Mondy, 2005). Kirkpatrick's four level evaluation model is shown in level one.

Purpose of the Study

The purpose of this study was to:

1. Investigate the influence of gender on students' reaction when exposed to computer-based hierarchy concept mapping strategy;
2. Examine the influence of gender on students' learning performance when exposed to computer-based hierarchy concept mapping strategy;
3. Explore the influence of gender on students' behaviour performance when exposed to computer-based hierarchy concept mapping strategy.

Research Questions

1. Is there any difference between the reaction of male and female students exposed to computer-based hierarchy concept mapping strategy?
2. Is there any difference between the learning performance of male and female students exposed to computer-based hierarchy concept mapping strategy?
3. Is there any difference between the behaviour performance of male and female students exposed to computer-based hierarchy concept mapping strategy?

Null Hypotheses

Ho1 There is no significant difference between the reaction of male and female students exposed to computer-based hierarchy concept mapping strategy.

Ho2 There is no significant difference between the learning performance of male and female students exposed to computer-based hierarchy concept mapping strategy.

Ho3 There is no significant difference between the behaviour performance of male and female students exposed to computer- based hierarchy concept mapping strategy.

Methodology

This study assessed a developed Computer – Based Hierarchy Concept Mapping Instructional Package (CBHCMIP) on chemical bonding. After the instructional package had been designed, validated and tested appropriately, Kirkpatrick’s evaluation model was employed for evaluating its effectiveness with particular focus on the first three stages of reaction, learning and behaviour.

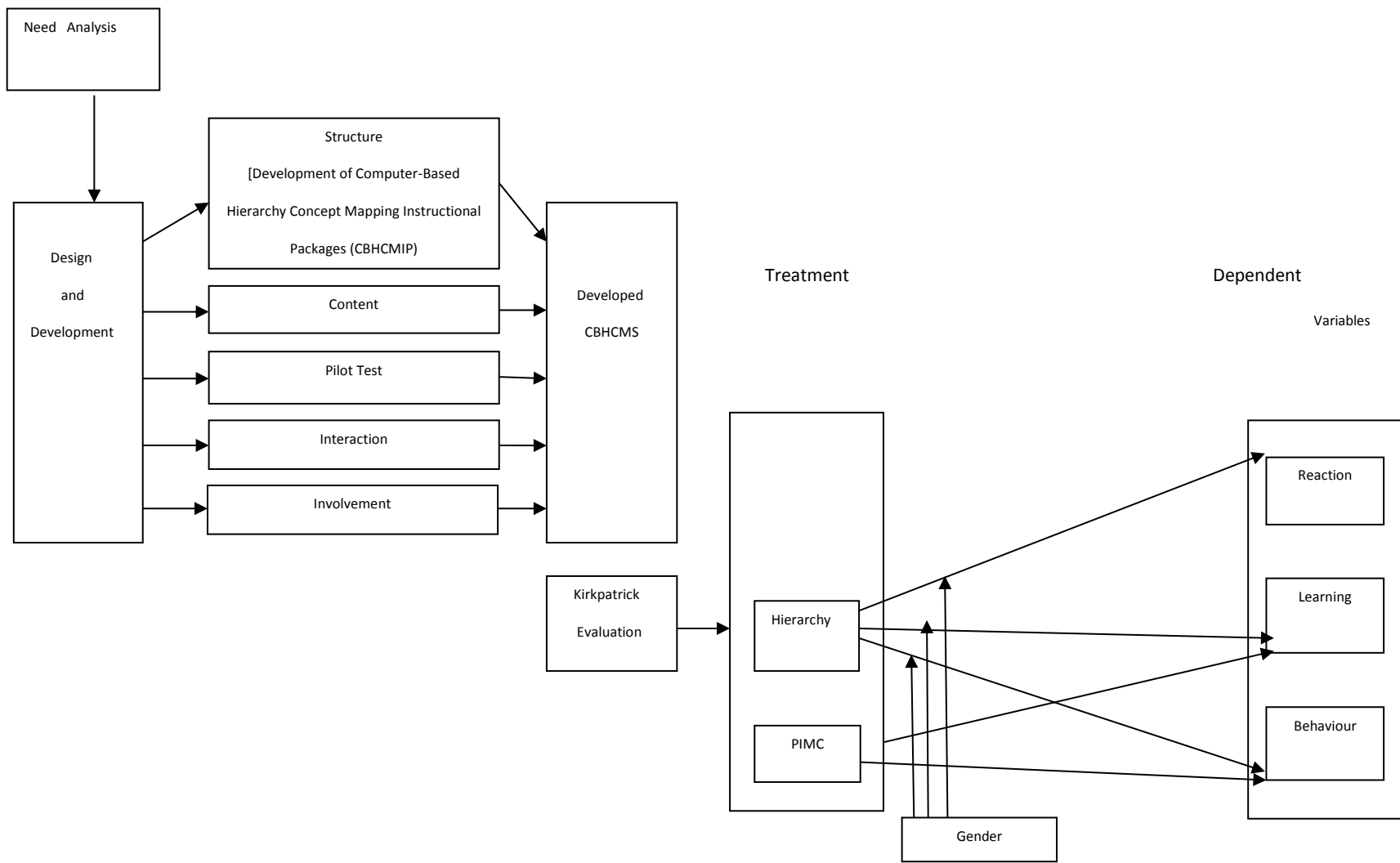


Figure 2: Conceptual Model for Development and Assessment of Computer-Based Hierarchy Concept Mapping Strategy

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A developed package was employed as a learning strategy, assessment was carried out using an adapted Kirkpatrick Evaluation Model (Reaction, Learning and Behaviour). In the process of evaluating using the adapted Kirkpatrick model, pre-test, post-test, non-equivalent and non-randomized control group was utilized.

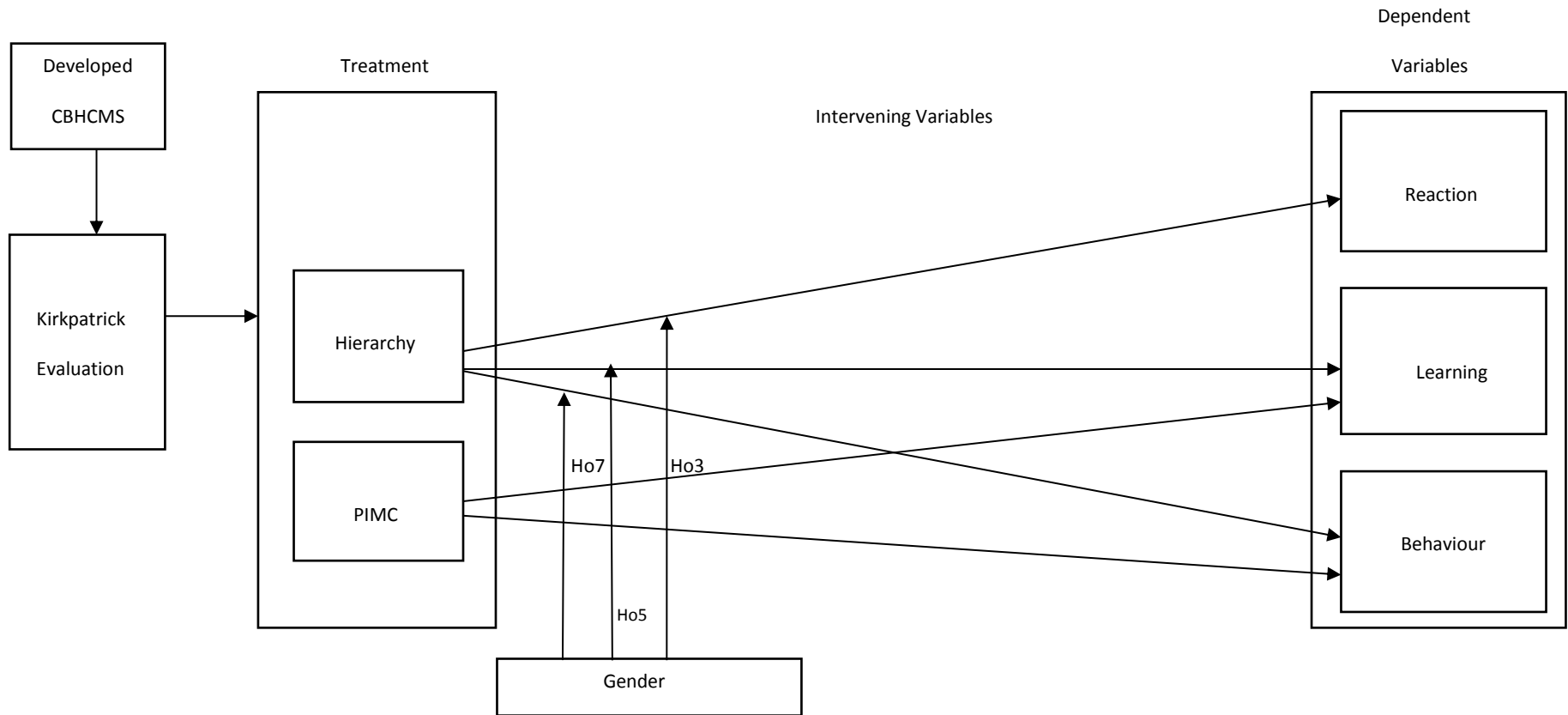


Figure 3: Hypothesized Model for Effectiveness of Computer-Based Hierarchy Concept Mapping Strategy

Methods

Sampling and Sampling Technique

All senior school students of chemistry in Osun State served as the general population for this study. The target population was all senior school one (SS1) chemistry students in Osun State. SS1 was considered appropriate because they are not preparing for external examination and the topic treated in this research was within the SS1 syllabus.

A four-stage sampling technique was adopted for this study. Firstly, a purposive random sampling was adopted to obtain two secondary schools in Osun state. These schools were purposively sampled based on equivalence (laboratories, facilities and human resources), school type (private schools), school location (urban area: Osogbo and Ile-Ife towns), gender composition (mixed schools), well equipped (computer laboratories with all required software and hardware components, regular power supply and alternative supply of power in case of power outage), exposure (students and teachers exposure to the use of computer in their schools). Secondly, the selected two equivalent co-educational/mixed schools were randomly assigned to an experimental and a control group using simple random sampling technique.

Thirdly, two intact science classes offering chemistry from the two schools selected were randomly selected using simple random sampling technique. Finally, stratified sampling technique was used in selecting sample size for this study. By implication, the researcher arranged the list of students in the school into different strata based on gender (male & female). The study being experimental will be difficult to carry out on a large sample. Thirty three SSS1 students comprising of twenty one males and twelve females constituted the experimental group. The control group had thirty six students, which was consisted of twenty two males and fourteen females.

Research Instruments

The research Instruments used for this study consisted of the following:

- (i) Treatment Instrument: This comprised of Computer-Based Hierarchy Concept Mapping Instructional Package (CBHCMIP); and the Prepared Instructional Material in Chemical bonding aspect of chemistry (PIMC) developed by the researcher.
- (ii) Test instrument: Test instrument designed by the researcher was used to collect data for the assessment of the quality and instructional effectiveness of the developed learning strategies. The Chemistry Learners' Achievement Test (CLAT) consists of 30 item questions in which respondents were expected to answer all.
- (iii) Chemistry Learners' Reaction to Computer- Based Concept Mapping Strategies in Chemistry Inventory (CLRCCI). This is made up of a 20 item inventory that was used to elicit chemistry learner's reaction to the instructional packages.

Validation of the Instruments

Professional educational technologists validated the learning strategies in terms of its suitability for learning, logic of arrangement of its content, explicitness, appropriate emphasis on key concepts, proper illustration and interface switching. The CLAT and CLRCCI were as well validated with the assistance of experts in educational evaluation.

Reliability of the Instrument

Using test-retest method of reliability test and Pearson product moment correlation statistics to determine the internal and external consistency, a reliability coefficient of 0.730 was obtained for the CLAT and the CLRCCI had a reliability value of 0.861. Since these reliability coefficients were high above 0.5, then the test instruments were adjudged good for the purpose for which they were constructed.

Results and Discussions of Findings

In this section, the data collected were analysed and the findings were presented based on the null hypotheses generated in this study. The scores of the students in the study were analysed using t-test of significance.

Hypothesis One

There is no significant difference between the reaction of male and female students exposed to CBHCMS.

The reactions of male and female chemistry students exposed to CBHCMS were subjected to t-test statistical tool and the results are presented in Table 1.

Table 1: Description of the Reaction of Male and Female Students Exposed to CBHCMS

Sex	N	\bar{x}	SD	df	t	P
Male	21	29.9048	4.67873	31	0.317	0.753
Female	12	29.4167	3.34279			

Table 1 shows the mean difference in reaction of male and female chemistry students exposed to CBHCMS. The 21 male chemistry students (Mean= 29.90, SD=4.679) and the 12 female chemistry students (M=29.42, SD=3.343), had no significant difference, $t(31) = 0.317$, $p = 0.753$. Therefore, there is no significant difference in the reaction of male and female students exposed to CBHCMS. The null hypothesis is hereby accepted.

Hypothesis Two

There is no significant difference in the learning performance of male and female students exposed to CBHCMS.

The pre-test and post-test scores of male and female chemistry students exposed to CBHCMS were subjected to t-test statistical tool and the results are presented in Tables 2 and 3.

Table 2: Description of the Pre- test Performance of Male and Female Students Exposed to

CBHCMS

Gender	N	\bar{x}	SD	df	t	P
Male	21	1.952	1.1609			
Female	12	1.833	1.0299	31	0.295	0.770

Table 2 shows the mean difference in the pre-test performances of male and female chemistry students exposed to CBHCMS. The 21 male chemistry students exposed to CBHCMS (M=1.95, SD=1.161) and the 12 female chemistry students exposed to CBHCMS (M=1.83, SD=1.030) had no significant difference, $t(31) = 0.295$, $p = 0.770$.

Table 3: Description of the Learning Performance of Male and Female Students Exposed to CBHCMS

Gender	N	\bar{x}	SD	df	t	p
Male	21	7.8714	4.24913			
Female	12	3.9167	1.24011	31	3.979	0.001

Table 3 revealed the mean difference in the learning performance (post-test) of male and female chemistry students exposed to CBHCMS. The 21 male chemistry students exposed to CBHCMS (M=7.87, SD=4.249) and the 12 female chemistry students exposed to CBHCMS (M=3.92, SD=1.240) demonstrated a significant difference in learning performance, $t(31) = 3.979$, $p = 0.001$. Hence, there was a significant difference in the learning performance of male and female chemistry students exposed to CBHCMS. The null hypothesis was therefore rejected.

Hypothesis Three

There is no significant difference in the behaviour performance of male and female students exposed to CBHCMS.

The pre-test and retention test (behaviour) scores of male and female chemistry students exposed to CBHCMS were subjected to t-test statistical tool and the results are as shown in Tables 4 and 5.

Table 4: Description of the Pre-test Performance of Male and Female Students Exposed to CBHCMS

Gender	N	\bar{x}	SD	df	t	P
Male	21	1.952	1.1609			
Female	12	1.833	1.0299	31	0.295	0.770

Table 4 shows the pre-test mean scores of male and female chemistry students exposed to CBHCMS. Table 19 shows the mean difference in the pre-test performances of male and female chemistry students exposed to CBHCMS. The 21 male chemistry students exposed to CBHCMS (M=1.95, SD=1.161) and the 16 female chemistry students exposed to CBHCMS (M=1.83, SD=1.030) had no significant difference, $t(31) = 0.295$, $p = 0.770$. Hence, there is no significant difference in the pre-test performance of male and female students exposed to CBHCMS.

Table 5: Description of the Behaviour Performance of Male and Female Students Exposed to CBHCMS

Gender	N	\bar{x}	SD	df	t	P
Male	21	7.8348	4.07304	31	3.019	0.005
Female	12	4.8083	1.60537			

Table 5 presented the mean difference in behaviour performance of male and female chemistry students exposed to CBHCMS. The 21 male chemistry students exposed to CBHCMS (M=7.84, SD=4.073) and the 12 female chemistry students exposed to CBHCMS (M=4.81, SD=1.605), demonstrated a significant difference in learning performance, $t(31) = 3.019$, $p = 0.005$. Hence, there was a significant difference in the behaviour performance of male and female chemistry students exposed to CBHCMS. The null hypothesis was therefore rejected.

Discussion of Findings

1. Findings on the influence of gender on students' reaction to the learning strategy

The result of analysis of reaction, using t-test of significance showed no significant gender difference for learners exposed to computer-based hierarchy concept mapping strategy. This finding showed that students' reaction to computer-based hierarchy concept mapping strategy did not differ as a result of their gender. This probably could have been due to the high computer literacy level as well as the general enthusiasm of today's youths towards the use of computers irrespective of their gender.

2. Findings on the influence of gender on students' learning performance when exposed to computer-based hierarchy concept mapping strategy

Results of analysis related to gender and students' learning performance revealed that there was a significant difference in the learning performance of male and female students exposed to computer-based hierarchy concept mapping strategy, male students had a significantly higher learning performance when exposed to computer-based hierarchy concept mapping strategy than their female counterparts exposed to the same strategy.

3. Findings on the influence of gender on students' behaviour performance when exposed to computer-based hierarchy concept mapping strategy.

Results of analysis related to gender and students' behaviour performance revealed that there was a significant difference in the behaviour performance of male and female students exposed to computer-based hierarchy concept mapping strategy. Male students had a significantly higher behaviour performance when exposed to computer-based hierarchy concept mapping strategy than their female counterparts exposed to the same strategy.

Conclusions

The result obtained from data gathered and analysed in this study during the course of evaluating the developed learning strategy, indicated that the learning strategy is appropriate for learning and was found effective for learning the chemistry concept it contain. This finding is in line with Buehl and Fives (2011), who stated that concept mapping is suitable for developing reflexive and collaborative learning and can be used both as teaching or assessing tools. The finding is also in line with that of Andrews, Tressier, and Mintzes (2008); Miranda-Correia, Silva and Romano-Junior (2010) as well.

The findings in this study showed that the use of Computer- Based Hierarchy Concept Mapping strategy (CBHCMS) elicited a highly positive reaction from students. There was a significant improvement in the learning and behaviour performances of chemistry students exposed to the learning strategy. Thus, it can be deduced that the use of Computer-Based Hierarchy Concept Mapping Strategy (CBHCMS) produced a remarkable improvement in students' reaction, learning and behaviour performance. The use of CBHCMS as the result of this study indicated is a reliable and efficient mode of learning chemistry concepts. Students were motivated to learn using the instructional strategy, since it is easy to use, user friendly and does not require much guidance before use.

Gender had no significant effect on the reaction of chemistry students exposed to computer-based hierarchy concept mapping strategies. This finding conforms to the findings of Okon (2005) who concluded that gender has no significant influence on students' reaction to science. This finding negates the earlier findings of Kost, Pollock and Finkelstein., 2009 (2009) and Perie, Moran & Lutkus (2005) who concluded that gender has influence on students' reaction when exposed

However, male students exposed to computer- based hierarchy concept mapping strategy performed better with a significantly higher learning and behaviour performances than female students exposed to the same learning strategy. This finding agrees with the earlier findings of Danmole and Adeoye (2004), who found out that male students performed significantly better than their female counterparts when exposed to concept mapping strategies. It contradicts earlier findings of Aiyedun (2000) and Aderogba (2006) who both found that

there was no gender difference in the performance of male and female students exposed to concept mapping strategies.

This implies that gender is likely to be a determinant factor for students learning as well as behaviour performance in chemistry. Hence, a useful model for the development and assessment of the effectiveness of computer-based hierarchy concept mapping strategy has been derived as shown in Figure 4.

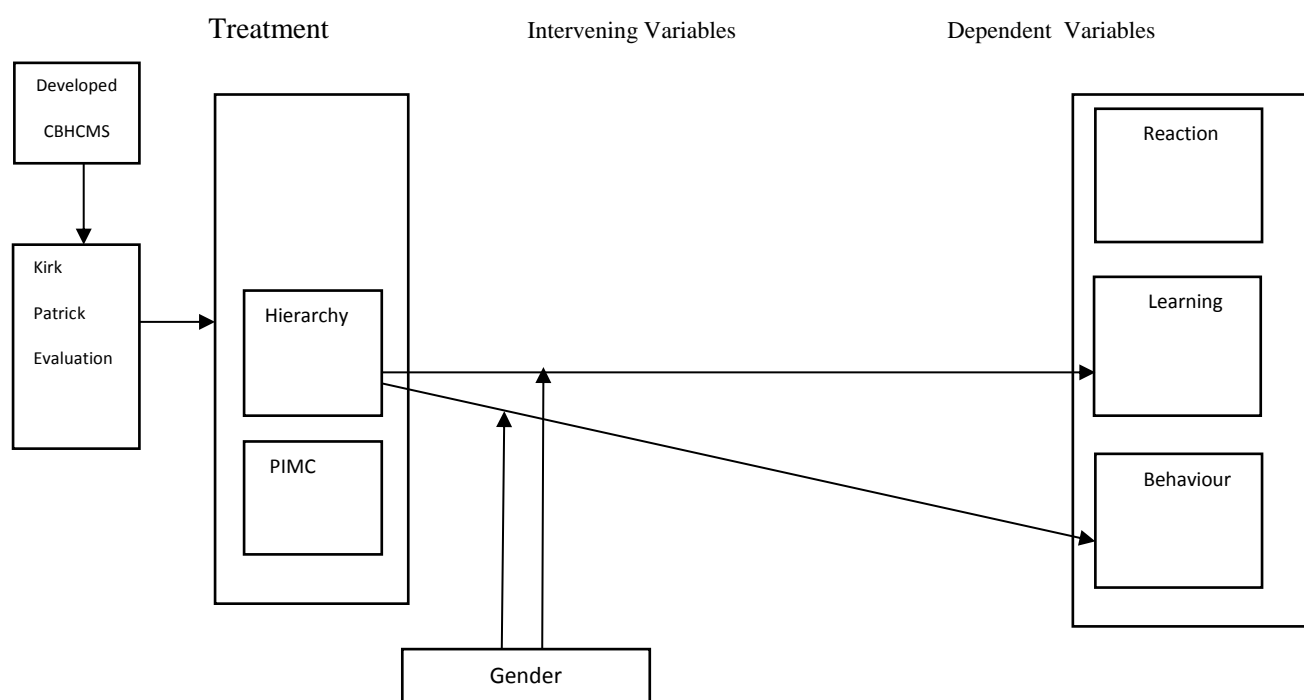


Figure 4: Derived Model for Effectiveness of Computer-Based Hierarchy Concept Mapping Strategy

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A CONTEXT-AWARE BUSINESS INTELLIGENCE FRAMEWORK AS THE BASIS FOR UNDERSTANDING MODULES AT-RISK AT A SOUTH AFRICAN UNIVERSITY

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Abstract

Program and module reviews are important quality assurance exercises, within the South African higher education institutions. This paper, shows the authors' efforts to determine the riskiness of academic modules at a South African University. In determining the modules at risk at a South African University, the authors used a hybrid of sequential and cyclical methodological approaches, based on a context-aware business intelligence framework. The risk indicators derived from academic module enrolment data elements, were weighted and aggregated to determine the riskiness of a module. The results showed that the riskiness of a module can be zero, weak, strong and extreme. Depending on the riskiness of a module, the institution can determine the appropriate intervention strategies for students to succeed in passing the module.

Keywords: Risk Modules, Business Intelligence, Degree of Difficulty, Content Knowledge

Introduction

The expression "*content knowledge*" denotes to the corpus of knowledge and information that the students are anticipated to learn in a specified subject, module or content area (Ball, Thames, & Phelps, 2008). In this paper, content knowledge represents the facts, concepts, theories, and principles that undergraduate students at a South African University are taught and learnt in identifiable academic courses. The facts, theories or concepts engraved in the different academic modules at a South African University, herein referred to as modules, have different degrees of complexity. The use of the term "content knowledge" has matured considerably in recent years, partly because educators now ordinarily use the expression as a shorthand means to pronounce a useful technical differences amongst "knowledge" and "skills" (Anghel, 2015; Ball et al., 2008). The riskiness of a module at a South African University is determined by varied factors, which are herein referred to as module risk indicators.

This paper focusses on the riskiness of the module rather than focussing on the students at-risk which take into account cognitive and social risk indicators (Cuseo, 2015; Mehta, 2014; Worley, 2007). The expression "at risk" is employed frequently to describe students who are

academically performing dismally, and it has a resilient perspicacious meaning. In that regard, the term has no dependable definition and can be regarded as stigmatizing particular student groups. Nonetheless, it is extensively used, within the cognition and education fields. Despite the flexibility, it is still imperative to have a standard or a reference point for a clear communication of what “at risk” module means (Trends, 2006). This paper emphasizes some of the issues surrounding the concept. The information obtained on the riskiness of a module should assist a South African University in one of its core business mandate, which is, teaching and learning. The other issue associated with the riskiness of a module, is to conceptualize it methodologically. In that regard, it is important to conceptualize the modules at risk at a South African University, using theoretical and practical foundations of business intelligence (BI).

Context-Aware Business Intelligence Framework

Mutanga (2016), defined a context-aware business intelligence Framework (CABIF) as a situated set of concepts, techniques, tools, ideas or facts that provide support for business intelligence initiatives within the South African Higher Education Institutions (SAHEIs). The CABIF in the SAHEIs, requires BI practitioners to know and understand various institutional core business contexts (Mutanga & Kadyamatimba, 2016). According to Mutanga (2016) and Mutanga & Kadyamatimba (2016), the CABIF starts with the Basic Context, which requires the planning and approval of academic qualifications at an SAHEI. The Process Context immediately follows, depicting macro- process BI contexts and micro-process BI contexts. Both micro and macro process contexts are related to direct business processes within the institution. In order to get value from the BI system, the CABIF has the Business Intelligence Context, which has the data architecture, technology and product architecture, data analysis framework and the design of the BI application. To achieve all the elements of the BI Context of CABIF, there is a need of a triad of skills, i.e., IT skills, analytic skills and business skills (Mutanga, 2015, 2016; Mutanga & Kadyamatimba, 2016). The triad of these set of skills, form the Business Intelligence Skills Context of CABIF. Information assets, ICT, and business processes need to be governed methodologically at each SAHEI. Identifying the Governance context of CABIF, Mutanga (2016) argued that it is crucial for most of the contexts of the CABIF. The BI design and implementation itself rely on the various governance frameworks, mechanisms and principles in place. This paper addresses four research questions, objectives, and the research methodology used to identify modules at risk at a South African University.

Aim

To develop mathematical metrics that determine the riskiness of an academic module at a South African University

Objectives

- (1) Identify modules at risk at a South African University
- (2) Distinguish different risk indicators for academic modules at a South African University
- (3) Develop standard formula for calculating the riskiness of an academic module at a South African University
- (4) Identify possible use of the information obtained from modules at risk within a South African University.

Research Questions

- (1) Which academic modules are at risk within a South African University's current Programme Qualification Mix or academic structure?
- (2) What are the different indicators that can be used to identify at risk modules within a South African University?
- (3) What standard formula can be used to calculate the riskiness of a module within a South African University?
- (4) How useful is the riskiness of a module to the core business of a South African University?

At most higher education institutions (HEIs) within South Africa, a formal university-wide standard for academic performance determines a student's academic standing (Company, 2012). This is clearly shown by institutional efforts to establish Centres for Higher Education Teaching and Learning. HEIs endeavour to have students with good academic standing, semester by semester, within their individual programs in order to achieve high success rates and throughput rates. Although there are various factors that contribute to academic performance of students, (Anghel, 2015; Cuseo, 2015; McKee & Caldarella, 2016), this paper will focus on the degree of complexity of a module, and elucidates on its riskiness. The theoretical framework will elucidate on the theoretical and practical foundations of modules at risk within a South African University.

Theoretical Framework

The term "*at risk*" has been associated with academic performance of students, with the grades of summative and formative assessments obtained by students being the determinants of the academic riskiness of students (McKee & Caldarella, 2016). Most institutions offer academic support services to academically at risk students (Company, 2012). The standards to identify at-risk students vary from institution, faculty, department or school, and usually reflect different programs in the curriculum (Cuseo, 2015; Fryer, Ginns, Walker, & Nakao, 2012; Worley, 2007). According to Company (2012), faculties use different scales to distinguish academically at-risk students. As an example, a student might be academically at risk if any assessment is below 50% (Fan, Williams, & Corkin, 2011). This usually depends on institutional priorities and definitions of the academic risk indicators.

Academically At-Risk Students

The identification of academically at-risk students have focussed primarily on factors that influence the students' test scores (Anghel, 2015; Cuseo, 2015; Mehta, 2014). Some studies have focussed on the correlations between student demographics and their test scores (Cuseo, 2015), and some examining students' substance abuse and their academic performance (Anghel, 2015). The studies on students' substance abuse concluded that the majority end up academically excluded or dropout from the academic programs. The studies for academically at-risk students focus mostly on bivariate relationships among the different risk factors. In the process of identification of students who are likely to be academically at-risk, tracking systems are usually employed in most institutions. The tracking systems are categorised as early warning systems, Early Alert systems, student tracking systems etc.(Company, 2012). Student tracking systems, are therefore equipped with tools to review the students' academic performance and grades across all courses, and reports on students who are likely to be academically at-risk. As Team (2009), indicated it is also important to assess the students' performance in historically challenging courses. Company (2012), argues that it is more efficient and effective to evaluate student performance in select courses, especially for large module enrolments.

Degree of Complexity of an Academic Module

Complexity has been demarcated literally based on the appearances of "*the behaviour shown by a complex system*", as indicated by Neil (2009). Complexity is not easy to define, as it can signify various things to diverse people. In the scientific community, there is yet an exclusive definition of complexity (Neil, 2009; TEQSA, 2012). Several studies unearth the mystic ingredients which render something complex as contrasting to just being intricate, and show how complexity is profoundly entrenched in the everyday life (Neil, 2009). Weaver (1948) identified that one of the problems in tackling complexity matters has been sanctifying the instinctive conceptual distinction amongst the huge quantity of inconsistencies in relationships extant in random collections, and the sometimes large, but smaller, number of relationships between elements in systems. By definition "*complexity science is the study of the phenomena which emerge from a collection of interacting objects*" (Neil, 2009, pp. 3-4).

Complexity can be associated with the degree of an academic module. An academic module fits into the definition of a complex system as it consists of a set of interacting theories, facts and principles, which in this paper, has been previously defined as subject content knowledge. This paper looks at the degree of complexity of an academic module, hence it refers to the at-risk module. The degree of complexity of a module is not looked at based on the complexity of the content that constitute the module, rather this paper looks at it based on attributes that constitute module enrolments. The academic module as a system, contains an assembly of numerous intermingling objects or "agents"(Neil, 2009; Weaver, 1948). The attributes that constitute module enrolments are herein referred to as module risk indicators.

The authors are of the view that when these attributes are aggregated, they bring forth the degree of complexity of a module, hence the 'riskiness' of the module.

Module Risk Indicators

In the education field, there is no such thing as an easy academic module, as many researchers have identified different aspects to consider in student academic performance (Anghel, 2015; Cuseo, 2015; Mehta, 2014; Neil, 2009). The academic performance of a student has been measured by their social, cognitive and emotional strengths including internal institutional academic support initiatives (Fryer et al., 2012; TEQSA, 2012). As to which actually is the most difficult academic module within an institution, is an impossible task to handle (Ball et al., 2008). The reason is that, there are many competing factors, which may need to be weighed in order to determine the complexity of a module. What is important is to determine a set of indicators or factors that determine the complexity of a module. The complexity of a module in this case, determines the probability that a student can fail that module. The probability of a student to fail a module determines the riskiness of that module.

A risk factor or a risk indicator, is a measure used frequently in management to designate how risky an activity is (Anghel, 2015; Cuseo, 2015). The risk indicator is also an indicator of the possibility of future adverse impact. In this paper the risk indicator of a module at a South African University, is a possible measure that designates the possibility of a module to be failed by a quantum of students. The use of a system of indicators in assisting in decision making vary from one industry to another (Saqib & Siddiqi, 2016). This largely depends on their objectives and scope, and in determining indicators for modules at risk, the factors that can predict the likelihood for students to fail a module play important role (Cuseo, 2015; McKee & Caldarella, 2016). One issue to consider in the usage of a system of indicators for determining the riskiness of a module, is to identify the weightage of each of the indicators (Cuseo, 2015; Saqib & Siddiqi, 2016)

Determination of Weightings for Module Risk Indicators

The determination of the weightings factors for risk indicators for modules, starts with the consideration of factors that can influence the likelihood for a student to fail a module. According to Saqib & Siddiqi (2016), the basis is to work down on a structure which determine the attributes that can affect academic performance. It is also notable that, each of the attributes can be decomposed to lower levels of granularity, to achieve completeness. The decomposition of the attributes of the module risk indicators can act as gateways to determine the weighting factors (WFs) for each module risk indicator. Within the academic world, it is important to note that only specific academic risk indicators are directly measurable (Anghel, 2015; Saqib & Siddiqi, 2016). Usually, the risk indicators that are directly measurable are the lower level atomic attributes, related to the module data. The values of each of the identified risk indicator are then aggregated by some standardised means or formula, to derive to a

quantitative value that determine the overall riskiness of a module (Saqib & Siddiqi, 2016). In developing the meta-schema for the aggregation of the weighting factors for the module risk indicators, the focus was showing how each academic module is doing compared to the others. The aggregation should convey objectively to a South African University management which are the problem modules, and to provide meaningful input to decision making processes in improving the pass rates for each module. The lesson one can draw up from Saqib & Siddiqi (2016), is that each indicator has a different degree of impact on the aggregated risk of a module, as will be shown in the following methodology section.

Research Design and Methodology

The determination of the riskiness of a module at a South African University followed a hybrid of sequential and cyclical methodological approaches. The sequential nature of the methodology, is indicated by the logical sequence of steps followed to determine the riskiness of a module. The cyclical or the iterative nature of the methodology indicates the continuous review of the steps, and the risk indicators in order to list the riskiness of a module. Figure 3.1, shows the methodological approach followed to determine the riskiness of a module at a South African University. The methodology included determining the module risk indicators; determining the measurement of the module risk indicators; developing the weighting factors of the module risk indicators; aggregating the weighted module risk indicators; and listing the module riskiness of a South African University academic modules;

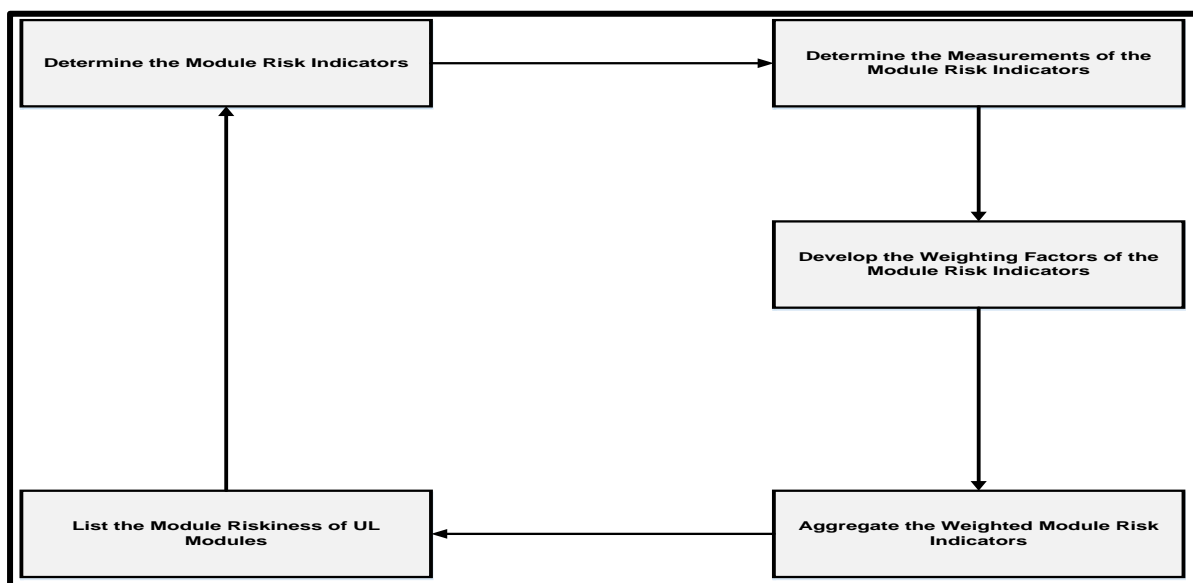


Figure 0:1: Sequential and Cyclical Methodological Approach to Determine Modules at Risk

The quality of the module risk indicator was not of primary concern, as prior to determining a module risk indicator a series of tests were done. These tests included data availability for the indicator, data quality, manipulability of the module risk indicator, amenability to set

objectives, and the positive and negative measures. The indicators that were selected and had passed the selection criteria, would be aggregated to reveal the riskiness of the module within a South African University. The mappings and the determination of modules at risk business process, required the authors to report on the modules at risk, using the reporting tools of the BI system at a South African University. These are the BI tools which present the analytics subjected to the BI data architecture. The analytics assisted in identifying the patterns and anomalies in the data, it stimulated the researcher to pose and answer further questions about the module risk indicators. The determination of Modules at risk at a South African University Using CABIF is shown in Table 3.1.

CABIF Context	Description
Basic Context: Premise	Academic Module Enrolments
Process Context: Macro-Activities	Teaching and Learning – Programme Review
Process Context: Micro-Activities	Academic Module Review
Business Intelligence Context	Data Sources: Data warehouse [SCHEMA] [HEDA DATA WAREHOUSE]; M02V_SUBJECT_ENROLMENTS
Business Intelligence Skills Context	IT Skills: Data Acquisition, Data integration, Queries, Stored Procedures, Report building and presentation Analytical Skills: Knowledge of Analytical algorithms Business Skills: Assessment Policy, definition of key data attributes related to an academic module
Governance Context	Regulatory and Compliance Requirements: POPI ACT Data Governance: Data Quality requirements specifications; Data Cleansing

Table 3.1: CABIF contexts for Determining Modules at Risk at a South Africa University

Determination of Module Risk Indicators and Data Collection

The basis for determining the risk indicators of a module at a South African University, started by developing common data elements that could be measured and monitored. The assumption considered was that, each module risk indicator can have a subjective influence on the other risk indicator, irrespective of its data structure and type. The following were the risk indicators drawn up: *student count; pass rate; module repeaters; module compulsory flag; possible major flag; period of study; SAQA credits; examination admission; and examination admission rate*. The student count refers to the number of students who fail a

module in the baseline year. The number of students who failed included those who failed the module in the baseline year, baseline year-1, baseline year-2 and baseline year-3. The same applies to the pass rates, it included the pass rates for the same years. The reason for choosing those baseline year, down to baseline year-3, was to include the historic performance for the module. The dependence of percentage of repeaters of the module in the same years, refers to the significance of the degree of complexity of the module.

The complexity of the module can also be determined by the level in which it is given in the curriculum. In this case at a South African University, an undergraduate module can be given in the first year up to the sixth year. A major is a structured sequence of subject content units in a module, or field of study. It provides the institution with the opportunity to develop the knowledge, understanding and expertise that will equip the students to move into a rewarding career after graduation, or to pursue further studies in a similar area at postgraduate level. The modules at a South African University are compulsory, elective or not. Each module has been attributed a number of credits, that determine the number of notional hours attributed to it within the curriculum. The other factor that determined the riskiness of a module was the examination admission rate. Examination admission rate, was also considered to be an indicator of the degree of complexity of a module. In the determination of the risk indicators for the modules, the rating of the indicator was key. The data values for each of the risk indicator were considered and these determined the adjustment variation factor that was used to standardise the risk weightings. The risk indicator values and the standardised weightings for the risk factors are shown in Section 3.2.

Measurement and Weightings of Module Risk Indicators

The measurement and weighting factors of each of the identified module risk indicators, were determined by whether it was a leading or lagging indicator, the dependence on other risk indicators and the relative significance of each indicator compared to other risk indicators. Each of the risk indicators' had its data values standardised and weighted. The justification and rationale behind the weightings and their variations are explained in the next section. It is important that, the weightings took into account past academic experiences with the modules. The module risk indicators may also be zero, weak, medium, strong or of extreme impact on the institutional core business of teaching and learning. As mentioned before, each of the weighted risk indicator was standardised and weighted, then aggregated to reflect the overall riskiness of a module. The module risk indicators were as follows:

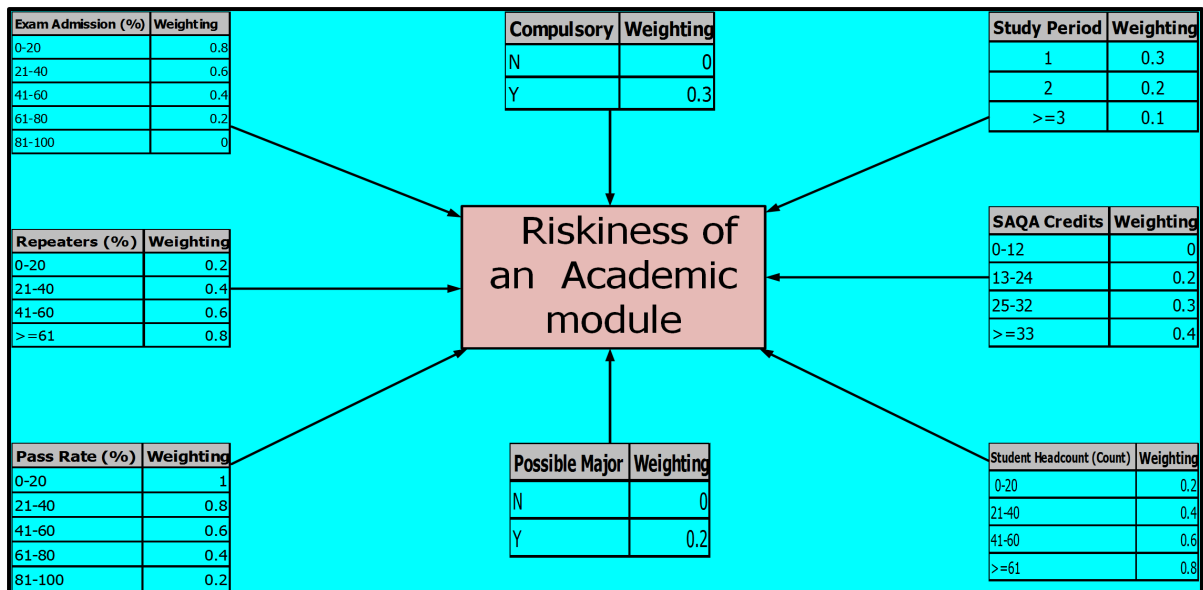


Figure 0:2 Module risk indicators and respective weightings

Considerations for Weighting Factors

(1) Number of students who failed are directly proportional to the weighting, the less the number of students who have failed, the less the weighting; (2) The module pass rate is inversely proportional to the weighting, the lower the pass rate the higher the weighting; (3) The number of students repeating in a module is directly proportional to the weighting, the less the number of repeaters, the lower the weighting; (4) If a module is not compulsory, it's risk impact is almost negligent, and if its compulsory its risk impact is weak, and has a weighting of 0.3; (5) Modules in the first year of study have an extreme risk impact, and hence they a high weighting factor compared to successive years. Historically more students in the first year are likely to fail a module; (6) The SAQA Credits have a direct relationship with the weighting factor. The lower the number of SAQA credits, the lower the weighting factor. The SAQA credits is an indication of the time the student invest on the module within the curriculum;(7) Examination Admission Rate is inversely proportional to the weighting factor, the lower the percentage of students admitted to sit in the final examination of module, the higher the weighting.

Data Analysis and Results Presentation

The data analysis started by the summation of all the risk indicators extracted from the M02V_SUBJECT_ENROLMENTS database. The weightage was designed in such a way that, each of the risk indicator has its own impact on the overall module risk.

$$MR = \sum_{i=1}^{16} WFRi, \text{ Where MR is the overall riskiness of a module, and WFR}$$

is the weighted factor of the risk indicator, i and $i = 1 \dots 16$

The summation of the weighted factors of each of the 16 risk indicators gave the overall riskiness of a module. The module is extremely at risk, if it has the overall riskiness of 11, achieved after the summation of the risk indicators. The conceptualised modules at risk

solution was developed as an SQL Report within the PowerHEDA environment, and the filters to the report are shown in Figure 4.1. The University of Limpopo, is one such South African university that has embraced the whole paradigm of modules at risk elucidated in this paper. The report is a culmination of linking CABIF, and the tenets of one of the academic quality assurances processes at South African University and is of great value in the module review business process.

Figure 0:3: PowerHEDA Undergraduate Modules at Risk Report Filters

Conclusions

The weightage of each module risk indicator is a strategic intent within the teaching and learning domain, and depends on several other factors. In considering the values of the weighting factors for all the risk indicators, they were extrapolated between 0 and 1. The final weighted academic risk module is dependent on the normalised or standardised summation of the 16 risk factors. The responses to the research questions are as follows:

- (1) *Which academic modules are at risk within a South African University's current Programme Qualification Mix or academic structure?* Depending on the overall aggregated weighted risk factors, the resultant module riskiness may result into being zero, weak, medium, strong or of extreme impact on the institutional core business of teaching and learning. A module is extremely at risk, if it has the overall riskiness of 11, achieved after the summation of the risk indicators, based on the aggregated weighted risk factors.
- (2) *What are the different indicators that can be used to identify at risk modules within a South African University?* The subjective interpretation of risk indicators that can make the students pass or fail a module, are important data elements to consider when determining the riskiness of a module. As long as the data elements, which constitute risk indicators are defined consistently, and the weightings standardised and determined scientifically, the riskiness of a module can be determined.
- (3) *What standard formula can be used to calculate the riskiness of a module within a South African University?* The formula to calculate the riskiness of a module was derived based on the weightage of the identified risk factors, and was designed in such a way that, each

of the risk indicator has its own impact on the overall module risk. The formula is as follows:

$$MR = \sum_{i=1}^{16} WFRi_i,$$

Where MR is the overall riskiness of a module, and **WFRi** is the weighted factor of the risk indicator, **i** and **i = 1...16**

- (4) *How useful is the riskiness of a module to the core business of a South African University?* This work contributes to the review of academic programmes at a South African University as stipulated in (SENATE, 2016). Programme design should “maintain an appropriate balance of theoretical, practical and experiential knowledge and skills”, as proclaimed in the Criteria for the Review of Academic Programmes at a South African University (SENATE, 2016, p. 272). The understanding and conceptualisation of the riskiness of a module provides pathways to understand if there is sufficient subject content knowledge, aligned to its degree of difficulty.

In summary, this paper contributes to the module performance related information during the reviewing process of academic modules at a South African University. The authors used the CABIF to develop and derive a detailed report on module performance using a baseline year. The longitudinal analysis of academic modules at a South African University, are studies that looks on how students persist in a module (progression), how they are retained in the module (retention), or whether they are excluded from the module (attrition). In essence, longitudinal module performance analysis assist in academic administration, teaching and learning and enrolment planning activities. In this case, the authors have chosen the teaching and learning business area, and are specifically looking at modules at risk within a South African University.

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EDUCATIONAL TECHNOLOGIES IN DISTANCE EDUCATION: BEYOND THE HORIZON WITH QUALITATIVE PERSPECTIVES

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Abstract

In this paper, the authors introduce research with the aim of providing a qualitative perspective on academics' use of educational technologies – this is done towards effective teaching for meaningful e-learning to address the challenges of Information and Communication Technology (ICT) courses in an online and open distance education environment. Arguments presented centre on formulating and situating significant concepts within an appropriate theoretical and conceptual framework. The paper proceeds to a review of the literature on research into how academics use educational technologies towards effective teaching for meaningful e-learning, in order to increase throughput rates, in some cases in online and/or open distance education environments. As an example of a research design that was implemented in a previous investigation, a phenomenological study was used as part of a qualitative, interactive design in order to investigate student interaction experiences in an online and open distance education environment. Aspects relating to the data collection instrument, sample and sampling technique, validity and reliability of the instrument and data analysis were discussed in an earlier paper. Although some perspectives on qualitative findings are provided, the paper mainly discusses findings aimed at providing a qualitative perspective on academics' use of educational technologies towards effective teaching for meaningful e-learning to address the challenges of ICT courses in an online and open distance education environment. Conclusions are presented, including a summary of the most important findings. The authors show how these findings could make a significant and original contribution regarding emerging trends in, and the promotion and development of knowledge in fields relating to, academics' use of educational technologies towards effective teaching for meaningful e-learning in an online and open distance education environment.

1. Introduction

This study represents a single site study of the School of Computing (SoC), one of the schools in the College of Science, Engineering and Technology (CSET) at the University of South Africa (UNISA). This university offers online and open distance education that draws its student population from all over the world. The institutional Virtual Learning Environment (VLE) offers a range of educational technologies aimed at maximising the collaboration between academics and their students.

In the research reported on in this paper, the authors therefore introduced research with the purpose to provide especially qualitative perspectives on academics' use of such educational technologies towards effective teaching for meaningful e-learning to address the challenges of Information and Communication Technology (ICT) courses in an online and open distance education environment. Although Mukasa-Lwanga and Goosen (2014) investigated such technology use towards effective teaching for meaningful e-learning in an open distance education Computing environment, their paper provided a mainly quantitative perspective.

As affirmed by Botha (2010), the cost of low throughput is very high, not only for distance education higher institutions, but also for their students. In order to work towards achieving the aim set for this study, the following objective will be used as focus for the research reported on in this paper: to indicate how academics used various educational technologies in the selected courses.

Qualitative data, relating to how academics are using various educational technologies to move beyond the horizon of their current teaching practices, by providing qualitative perspectives, and specifically for renewing their students' e-learning experiences and assessment, especially in distance education, will thus be provided.

This paper focuses on the following primary research question:

- How are academics using educational technologies towards effective teaching for meaningful e-learning in an online and open distance education environment?

The secondary questions that will assist in delving into the primary research question include:

- How do academics use various educational technologies in selected courses?
- What are academics' perceptions about the use of educational technologies?

Main arguments presented centre on formulating and situating significant concepts against the background of, and within an appropriate theoretical and conceptual framework. The paper proceeds to a review of the literature on research into how academics use educational technologies towards effective teaching for meaningful e-learning, in order to thus increase throughput rates, in some cases in online and/or open distance education environments.

Although some perspectives on qualitative findings are provided, the paper mainly discusses findings aimed at providing a qualitative perspective on academics' use of educational technologies towards effective teaching for meaningful e-learning to address the challenges of ICT courses in an online and open distance education environment.

The conclusions, which are presented, include a summary of the most important findings. The authors show how the findings of this research could make a significant and original contribution with regard to emerging trends in, and the promotion and development of knowledge in fields related to, academics' use of educational technologies towards effective teaching for meaningful e-learning in an online and open distance education environment.

2. Conceptual and theoretical background

Koohang, Riley, Smith and Schreurs (2009) investigated e-learning objects from the perspective of constructivist theory through to application. Frankola (2001) interrogated why students drop out, while Swanepoel and Mays (2010) worked towards a framework to support transformation through quality assurance at UNISA.

According to Van Schoor (2010, p. 41), considerable research on student “retention and throughput has been done at residential” universities. The UNISA definition of open distance education details it as “a multi-dimensional concept aimed at bridging” distances between students and their university, academics, courseware and peers regarding time, geography, economics and communication (Van Schoor 2010, p. 40). Open distance education “focuses on removing barriers to” accessing e-learning, flexibility of e-learning provision, student centeredness, supporting students and constructing e-learning “programmes with the expectation that” students can succeed.

While Menchaca and Bekele (2008) identified student and academic success factors in distance education, Killen, Marais and Loedolff (2003) made available research on the perceptions of South African students and academics in Business Management regarding success and failure in distance higher education. Muilenburg and Berge (2005) further provided a factor analytic study of students' barriers to learning for distance education.

In earlier work, Cannon, Umble, Steckler and Shay (2001) provided students' perspectives in a distance education degree and certificate programs in public health. While Battista, Forrey and Stevenson (2008) were of the opinion that it takes a virtual community to promote collaboration through student activities in online and distance education, Bekele and Menchaca (2008) offered a review of research on Internet-supported learning for distance education.

More recently, in her keynote address at this conference last year, Goosen (2016) provided examples related to both school learners and higher education students wanting educational technologies. Highlighting the challenges of such ICT courses, Goosen (2015a) reported on how educational technologies were used for an ICT for Development (ICT4D) Massive Open Online Course (MOOC) in the 21st century. Reporting on a community

engagement project, Goosen (2015b) showed how educational technologies can be used for growing innovative e-schools in the 21st century.

3. Literature review

Various studies, such as those by Frankola (2001), Swanepoel and Mays (2010), Tinto and Pusser (2006) and Van Schoor (2010), reiterated the importance of student support, specifically at universities offering online and open distance education, to enhance overall student performance. Related literature, which presented opportunities for further investigation, included Davis and Venter (2011). Although the latter authors looked at performance and success in an online and open distance education environment, their students were postgraduate ones in a business course - and whereas Chen and Tsai (2007) considered students' attitudes towards e-learning at Taiwan University, this paper will study academics' views from an African perspective. Even though Van Schoor (2010, p. 40) pointed out that the assessment of students' academic preparedness for studying in an open distance education environment is one of the numerous "factors that contribute to success", Tinto and Pusser (2006) are of the opinion that it is important to move from theory to action, by building a model that universities can operationalize for student success.

Nel and Ndeya-Ndereya (2011) pointed to the lack of face-to-face contact between open distance education students and their academics as one of the foremost reasons why e-learning environments are often experienced as being impersonal, lonely and lacking social presence. Ferreira and Venter (2011) therefore proposed the implementation of educational technologies such as discussion forums via institutional virtual learning environments in order to provide new options related to open distance education support.

Because of their physical separation from their open distance education academics, some students could only use email and the discussion forums available on the virtual learning environment to communicate - a student quoted in an article by Davis and Venter (2011) really appreciated the opportunities that these technologies presented. Dreyer (2010) agreed that academics should try to keep in touch with their students electronically through the institutional virtual learning environment, by using e.g. announcements and discussion forums.

The development of a virtual learning environment, myUNISA, has seen e-learning support being established for all of the courses offered (Swanepoel & Mays, 2010). There is, however, a need to develop an understanding that the overall student experience is affected by a wide range of contributions from different stakeholders. As a result of the cumulative effect of numerous subsystems and interdependent activities, these are required to work together in harmony. Such an environment requires active engagement by the student with

the process of learning, as well as several opportunities for interacting between students and other students, as well as students and their academics.

4. Research methods and techniques

4.1 Research design

When using qualitative research designs, most data take the form of words, as opposed to figures, and generally, researchers search through and explore these until they develop a deeper understanding. A case study research design investigates a restricted system (the so-called ‘case’), that employs numerous sources of data located in the situation. In the project discussed in this paper, the focus will be on several entities (courses) (McMillan & Schumacher, 2010), with each case represented by a particular course, selected for use as an example of a particular instance.

As an example of a research design that had been implemented in a previous investigation, Liu (2008) used a phenomenological study as part of a qualitative, interactive design in order to investigate student interaction experiences in an online and open distance education environment (Maree & Van der Westhuizen, 2007). This study also uses aspects of a phenomenological study, which attempt to describe participants’ perceptions, perspectives and understandings. Although the literature on social construction of knowledge, which is directly applicable to education, could also be looked at, it was not used in this particular study.

4.2 Data collection instrument

Aspects relating to the data collection instrument, population, sample and sampling technique, validity and reliability of the instrument and data analysis were also discussed in an earlier paper (Mukasa-Lwanga & Goosen, 2014).

4.3 Sample and sampling technique

Seven academics (five female and two male), who had been interviewed, will, for the purpose of this paper, serve as the sample from the interviews conducted to obtain qualitative data for this study.

4.4 Validity and Reliability of Instrument

In terms of qualitative data collection, Maree and Van der Westhuizen (2007) raised the argument that the intensely personal participation and comprehensive replies from participants capture adequate levels in terms of validity and reliability. The use a variety of strategies to enhance validity is required in especially qualitative research, since the validity of such designs include the extent to which perceptions and interpretations made had shared meaning between participants and the researchers. Several resources ought to be employed for comparing findings with each other, for ensuring the internal validity of qualitative research (Maree & Van der Westhuizen, 2007). As suggested by McMillan and Schumacher (2010), decisions were therefore made on how to ensure that the data collected is valid. Reliability with regard to qualitative studies can be regarded as findings being consistent with data collected (Maree & Van der Westhuizen, 2007). Dimensions towards reliability are therefore also being ensured in the more qualitative parts of the study.

McMillan and Schumacher (2010) agreed that validity in quantitative research can also include issues of reliability. The use of multi-method strategies could produce diverse insights regarding topics of interest and augment how credible, transferable, dependable and confirmable such data and resultant findings, as well as the analysis thereof, are (McMillan & Schumacher, 2010). These strategies also allow for quantitative research, enabling McMillan and Schumacher (2010) to indicate triangulation as being critical for the facilitation of interpretive validity. Such validity relates to data, interpretations and/or the conclusions arrived at by using a particular research method in a specific environment for a certain reason (Maree & Van der Westhuizen, 2007).

4.5 Data Analysis

In agreement with suggestions by McMillan and Schumacher (2010), the less experienced researcher (the second author) had especially qualitative data analysed independently by another more experienced researcher (the first author), who had not been involved in collecting the data. Data analysis was carried out to obtain a representation of the applicable participants and their environments.

5. Results and Discussion

5.1 Quantitative Results related to the Interviews

Most of the academics reported on in this paper were between 36 and 40 years of age. Please note that especially options at the lower ends of the scales that had been made available to participants, but had not been selected, are not shown in the tables - for example, in Table 1, no-one indicated an age of below 36 years of age, although such options were available.

Table 1: Ages of Participants

Element	Number	Percentage
36 – 40 years	3	43%
41 – 45 years	1	14%
46 – 50 years	1	14%
Older than 50 years	2	29%

Five of the interviewees each had a Master's degree as highest academic qualification, together with two Bachelor degrees. Two of them (not the same) also had a Higher Education Diploma as formal educational qualification, while none of the others had any such educational qualifications.

Table 2: Experience of teaching in an open distance education environment

Element	Number	Percentage
5 – 10 years	2	29%
11 – 20 years	4	57%
21 – 30 years	0	0%
More than 30 years	1	14%

Table 2 shows that the majority of these academics had between eleven and twenty years' experience of teaching in an open distance education environment, together with more than five years' experience of using the institutional virtual learning environment (see Table 3).

Table 3: Years' experience of using the institutional virtual learning environment

Element	Number	Percentage
5 years	3	43%
More than 5 years	4	57%

The authors of this paper will not identify the specific courses, in terms of which these academics were interviewed, but one of them placed in the top five in terms of the number of times that educational technologies had been used, while the remainder of them placed

between 10th and 21st. In terms of the rankings for their averages, these courses basically cover the spectrum from top three right through to some of the lowest performing ones. Although the majority of the applicable courses were Computer Science (COS) and Informatics (INF), others were also represented in the selection. These also represent a fair mix of first, second and third year level courses.

At the time of the interviews, six of the applicable courses were still being taught by these academics - although the course codes had been changed since 2010, the content remained largely unchanged - while another six of them were no longer teaching said courses. They had been the primary academic responsible for the applicable courses during 2010 in nine instances, and had a secondary role in six cases.

It is important to note that the number of responses for the courses in Table 4 exceeds the number of academics interviewed, as most of them were interviewed in relation to more than one course that they had been involved with. The majority (five) of the applicable courses that were discussed with these academics during their interviews had an average of between 251 and 500 students usually taking these courses per semester/year - five of the courses were offered over a year, with the others over a semester. Four of the courses on which these academics were interviewed, however, reported an average of more than a thousand registered students each - this casts a whole new light on what these academics have to say ...

Table 4: Average number of students on course

Element	Number	Percentage
100 – 250	4	31%
251 – 500	5	38%
501 – 750	0	0%
751 – 1000	1	8%
More than 1000	4	31%

Table 5: Years' experience of teaching a particular course

Element	Number	Percentage
4 years	1	7%
More than 4 years	14	93%

Table 5 shows that one of these academics had only four years' experience of teaching one of the two courses that she was interviewed on, while she and all of the other academics had more than that in terms of all of the other applicable courses.

5.2 Illustrative Qualitative Findings

In response to especially the two secondary research questions, this section will provide findings with regard to academics' perceptions about the use of educational technologies.

As first example of how one of these academics specifically used various educational technologies in the courses she was involved with, she used the **Announcements** technology a lot, as well as emails and content that was added to the **Additional Resources** technology. She added two new announcements over the course of each of the two semesters under review for the applicable second year course. During the first semester, she also twice revised announcements, six times added new content and twice read content. In an open distance education environment, she used announcements in the same way that a face-to-face academic at a residential university would announce in class that previous examination papers and/or their solutions were available for making copies. This particular academic also emailed examples of previous examination papers to students in an effort to increase the pass rate of her course. She believes that there are a lot of students who struggle with printing, because they do not have money. Although she adds previous examination papers and solutions on the additional resources technology, she feels strongly that students cannot study from a PC or SMS, but, instead, they need printed material for effective learning.

At the time of the interviews, this academic was also using the **Discussion Forum** technology on myUNISA, about once a month. In an open distance education environment, she used this technology to tell students to check what has been announced on myUNISA. She was not very active on the forum, as she is of the opinion that the students should use it to help each other. She indicated that the secondary lecturer uses this technology more often than her, to attend to students' queries and increase the pass rate. The other technologies she was using included SMS reminders to inform students to inform check their inbox for information forwarded for their attention - this could include urgent announcements that have been posted, regarding, for example, materials uploaded. Discussion classes were conducted over the **Video Conferencing** (VC) technology. It seems, though, that students prefer face-to-face discussion classes to the discussions over the VC technology, when she compared these using attendance lists.

Finally, this academic was also interviewed regarding a third year course that ran over a year. For this course, she once each deleted content, added a topic to the **Discussion Forum** and viewed the site statistics. In each of two months, she added new content twice, and also read through some of the content three times. While working in an open distance education environment, she did not own this particular course, but, instead, had to assist, because there was nobody to take it over at the time, to help and increase the pass rate.

One of the other female academics was commenting on the poor performance on her course, i.e. the "pass rate is usually between 21% and 25%. In general, the pass rate is below 30%." In her roles of course administrator and secondary lecturer respectively, she twice

posted two new announcements each during the first semester, while, in these same roles, she posted one new announcement each, and revised one announcement each, during the second semester. In an open distance education environment, she used announcements to tell students about assignments and provide more information if questions/instructions seem to be vague to them. She also used announcements when she has to inform students to e.g. submit their assignments in pdf format. She would then provide them with information on how to submit these, or how to convert to pdf. She also announces the extension of due dates for submissions. Through announcements, she alerts students about the availability of tutorial letters, solutions to assignments, etc. Any other administrative information that students require is posted as announcements. In order to increase the pass rate, she encourages and receives personal emails from students when faced with a problem on the course and assists them as required. She also gives them previous examination papers for practicing and feedback after they return their work to her. She realised that they learn a lot using this method - more than if she gave them the actual programming solution. She generally gives them emotional support to encourage them to continue with the course. She also frequently used the discussion forum, which is mainly used by students to discuss the course with fellow students. She makes frequent checks on the forum to give guidance on the topic under discussion. The Additional Resources technology is used whenever the need arises, for loading software required to be used by students on this course. She also uses additional resources to give students information to create pdf documents and submit the assignments. Finally, she uses the myUNISA Administration Support technology to look up students' marks, e.g. to compare performance in a particular assignment. She provides students with feedback on their assignments after marking, to ensure that they do not repeat mistakes in the examinations. This same academic also developed a tutorial to teach students programming. Unfortunately, she realised that students do not use it. Thus, she now asks e-learning tutors to assist and only give out solutions to those students who try out the tutorials.

Regarding the second first year course for which this academic was interviewed, she specifically pointed out that this course is a follow-up course to the one just described in the previous paragraph. Therefore, students must first pass COS1U before they register for COS1V (please note that these are not the actual course codes). The perspectives provided above are therefore also valid and applicable for this course. In her role of primary lecturer in this instance, in the first semester she twice each updated the site for this course on the virtual learning environment, and viewed the statistics related to the site, while in the second semester, she also twice viewed the statistics related to the site, in each of two months twice posted new announcements, as well as twice revising her own announcements.

The one male academic was discussing a second year programming "course with very low pass rate - always below 50%." For increasing the pass rate, the academics assigned to this second year course posted new content using the Additional Resources technology and sent out weekly Announcements - as indications of the former, in the first semester, two and four sections of new content was posted to the Additional Resources technology over the

course of two months, while in the second semester, six instances of such new content were added. In an open distance education environment, the Announcements already mentioned have been used for two years at the time of the interviews being conducted, and remind students what they should have covered by the end of every week. The intervention, however, did not yield good results, after putting in a lot of effort. He also indicated that students ask questions on the Discussion Forums technology. As an academic, he is there to try and point them in the right direction, but avoid giving the exact answer. Academics prefer students to discuss among themselves and only intervene when they feel a need to give guidance. To increase the pass rate, he tries to encourage students to participate. Students are reminded and encouraged to work on the tutorial matters and meet deadlines. The academics on this course, however, are of the opinion that students are not properly prepared from the first year. The academics on this course are of the opinion that it would be better if this course was offered over a year (as opposed to the current semester) to allow students enough time for practicing programming. Also, currently, there is too little time to cover the material. Improvement plans are submitted every semester with the final examination documents. He indicated that additional details could be obtained from the primary lecturer for this course.

One of the other male academics preferred to be interviewed especially with regard to a third year course for which the pass rate at the time of the interviews had usually been approximately 60% and for which he still was, at the time of the interview, the primary academic. In an open distance education environment, he used the Announcements technology for sending out general messages to students, for example, reminders about due dates for assignments, correction of mistakes in documents forwarded to students, informing students that results of examinations have been released, etc. Quantitative data supporting this shows that he, in each of two months, twice and in another month once, added new announcements, while he also once deleted one of his own announcements, as well as having twice revised some of his own announcements.

He uses the Discussion Forums technology mainly to initiate discussion on topics/activities that attract student interaction with fellow students. Students also start discussions with their peers based on experiences with their studies. Students may assist or inform each other on what they think are the right way of solving a specific problem. He twice added topics to the discussion forums and over the course of several months added five, three, one and another three replies to these.

This academic normally checks whatever study material is posted on the system for students' attention and double checks for correctness and validity. As examples of such activities, he once viewed the site statistics and over the course of several months read content on the Additional Resources technology seven, 22, two, four, one, another four, five and two times.

In order to increase the pass rate, students are always updated with current information on the course. They are also reminded of deadlines to ensure that the handing in of assignments

is done on time. These reminders assist to urge students to take responsibility to attend to their studies. By going through the content of the study material, he ensures that students correctly understand what is expected of them. Sometimes, he follows students' discussions to give them guidance and correct some wrong viewpoints from fellow students. When one considers general performance on the course, the challenge depends on the different type of students registered on the course every year. Sometimes, one may get a number of brilliant students and sometimes not so brilliant. In terms of other technologies that he was using for this course at the time of the interviews, he also sent SMSs to students for their attention regarding any urgent information.

For the sake of comprehensiveness, the authors will also add that in the other third year course that this academic was interviewed for, he on two separate occasions posted new Announcements, as well as once adding a reply on the Discussion Forums technology, over the course of the year.

6. Conclusion

In summary, the findings described how academics are using educational technologies towards effective teaching for meaningful e-learning in an online and open distance education environment. Answering this primary research question set for this study also confirmed and extended earlier research by e.g. Botha (2010): The findings indicated that announcements and/or discussion forums on the course website, together with SMSs, can potentially increase the pass rates on these courses in an open distance education environment. It could also positively impact student throughput across the applicable qualifications.

The secondary research questions assisted in delving deeper into academics' perceptions about the use of various educational technologies in the selected courses. Together with what the authors have shown with regard to these findings, in terms of originality, the depth of the research thus presented could make a significant contribution concerning emerging trends in, and the promotion and development of knowledge, in the field.

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ENHANCING DISTANCE LEARNING VIA COMPUTER-BASED HUBS IN CORRECTIONAL EDUCATION ENVIRONMENT: THE UNISA EXPERIENCE

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Abstract

The South African constitution makes education a right for every citizen. Correctional education is part of rehabilitation for offenders. In view of the unique conditions under which inmates study, it is argued that the use of technology can enhance learning for the achievement of correctional education goals. Offenders who pursue their studies join educational programmes either because they are serious to engage in meaningful activities as a second chance for them, and because such educational opportunities are offered, or just to while away time and fight boredom. Thus, learners in correctional education context have motives for embarking on education programmes and strategies must be found to maximise learning. The University of South Africa (UNISA) has partnered with the Department of Correctional Services (DCS) in launching a UNISA-DCS computer-based hub, a project aimed at providing computer-aided distance learning support for inmates by providing access to computers and internet, Wi-Fi and modem facilities for teaching and learning purposes. The study used a qualitative enquiry in a correctional facility with 350 female inmates, of which 90 participated in formal, non-formal and informal educational programmes. The study focused on 16 undergraduate and postgraduate inmates studying with South African universities and technical and vocational education and training (TVET) colleges through formal distance learning, and five correctional educators deployed in the Development and Education Section of the Centre and UNISA. Three focus group interviews were held with the undergraduate and postgraduate students. The findings validated that distance learning remains a viable option for inmates due to their restricted freedom. In exploring the currently operating hubs in Gauteng Province, the findings acknowledged the benefits accrued by inmates and the strides made by institutions of higher learning in advancing the use of computers and inmate-students' support, culminating in an expected increase in throughput and the success rate of students in the correctional education sector.

Keywords: Female inmates; distance learning; UNISA-DCS hubs; computer-based learner support; correctional education environment.

1. Introduction and background

Historically, the apartheid laws divided the country's education system into four separate racially-divided departments. The Whites had a better education system that was well-

resourced with good infrastructure and highly qualified teachers or educators. Then it was the Indian population, the Coloureds and lastly the Africans (Black population) who got the crumbs and left-overs from the three departments. During the apartheid regime, at least 63 – 68% of the Black population in South Africa was functionally illiterate because they were never schooled or never completed primary school education. The ratio of White literacy to Black literacy then was estimated at 263:5 (Wilson & Ramphele, 1989).

I remember a time when all the good jobs were reserved for the White people because they were the only people who had education. Now things are different, even African and Coloureds can work in the banks, the post office, and fill other good paying jobs. But the problem with our people is that they cannot afford to keep their children at school, because if they do, the family will starve and by the time the child has obtained his/her good paying job there will be no family left to enjoy the benefits.

(Ouma Anna, Philipstown cited in Wilson & Ramphele, 1989: 138)

There was a huge disparity in funding and facilities for the Black child compared to the other three groups, which surfaced with the implementation of the apartheid policies.

The scenario given above characterises the historical and structural poverty borderlines between the Whites and the Black population at the time (Legotlo, 2014). The situation prevails more than two decades into democracy despite the new government's changes in legislation and policies. There are various reasons why, to many South Africans, the situation is little changed. The majority of South Africans see political changes where Black leaders rule the country. Many still regard the economic struggle as far from over. The economic power of the country is still in the hands of a few Blacks and the White minority, and that still leaves majority of the population in dire need of resources and services like education. The structural poverty created by the many years of apartheid rule where the Black population still occupies townships far from economic centres still prevails. This study contends that such structures of society where poverty, unemployment, unequal distribution of resources, the disparity between the rich and poor and a large, still-unschooled population contribute significantly to high levels of crime where youths and young adults resort to criminal acts and end up in jail. When they go to correctional facilities without a good education, they are still vulnerable to societal problems and there is a likelihood they might re-offend in order to care for themselves and their families, if they remain unschooled during incarceration. For these reasons, the study conceived that educational programmes should be seen as a mitigating factor, and thus it is only if offenders had positive perceptions towards programmes offered in correctional centres, that they would be willing to participate in them.

According to the DCS, a third of the prison population is made up of youths aged 18 – 35 years, representing 35.4% of the whole prison population in South Africa (Department of Correctional Services, 2010). Another report by the National Youth Development Agency

(NYDA, 2011) revealed that incarcerated youths were held at 15 youth development medium and maximum facilities for aggressive crimes. The youths are catered for separately in terms of formal education, skills development (vocational and entrepreneur training), sports recreation, arts and cultural (SRAC) activities, production workshops and agriculture, care programmes, HIV/AIDS, risk profiling and risk assessment

The DCS offers formal correctional education, as well as non-formal adult education programmes, including vocational and production activities aimed at providing offenders who have worked on the prison farms or in workshops and production centres with an accredited and certificated record of their employment in these facilities. Their certification enhances their ability to find employment once back in the community, and perhaps decreases some of the stigma attached to having been an offender. Through adult education, formal and non-formal education and training programmes, the DCS has adopted an integrated approach towards poverty alleviation and social responsibility culminating in community empowerment and offender rehabilitation. Formal and non-formal education and training as provided within the correctional centres is designed to afford personal development to all offenders. In order to do so, the DCS has designed its educational programmes to be needs-based. This implies that educational, skills and other development-related programmes are aimed at facilitating the reintegration of offenders into their communities. Thus, the importance of information, communication and technology in the modern era cannot be underestimated at correctional centres for offenders pursuing their academic careers.

UNISA has been providing distance learning for inmates since time immemorial. The likes of the late President Nelson Mandela and many political prisoners during the apartheid regime furthered their studies during their incarceration through distance learning. While there were innovative ways for UNISA to support the inmate-students, and the majority completed their studies against all odds, times have changed and contemporary and technology-based methods have taken centre-stage in the provision of correctional education through distance learning.

The aim of this study was to establish the benefits accrued by enrolled UNISA student-inmates since the inception of the hubs and how technology-based hubs have contributed to the learner-support mechanisms in correctional centres. According to Mashabela (2015), nine computer-hubs have already been established in the nine provinces. This article focuses on one female correctional centre where the UNISA-DCS hub has been operational, to review the progress of the hub so far, and its impact on the distance learning of inmates.

1.2 Learning in Adulthood principles

Education in correctional centres as embraced within corrections and development key principles is a challenge not only in developing countries like South Africa, but also in the

developed world. “Recent studies in the USA, Russia and Serbia reveal that educational needs of prisoners are compounded by the absence of appropriately skilled and experienced teachers or other educational professionals in prison settings” (Jovanic, 2011: 80). There are various reasons why this is so. Many countries boast of their legal and policy frameworks, including South Africa, but reports indicate the lack of political will in implementing laws and policies. The DCS is left with this mammoth responsibility alone. The situation is such that stakeholders that should be playing their roles step aside and start pointing fingers to criticise what the DCS is *not* doing.

The theory of andragogy has its evolutionary history and origins in adult education. Knowles (1980), Nafukho, Amutabi and Odunga (2006) and Knowles, Holton and Swanson (2012) defined andragogy as the art and science of helping adults learn in which the teacher facilitates the learning process. The theory of andragogy was selected for its relevance to the study of adult learners, namely the offenders participating in educational programmes. Malcolm Knowles, a proponent of andragogy, developed five assumptions for the theory of andragogy, which is a theory contrasted to a theory of pedagogy – the art and science of helping children to learn. Knowles saw these assumptions as foundational to designing programmes for adults, and from these, numerous implications for the design, implementation and evaluation of learning activities with adults are derived (Merriam, Caffarella & Baumgartner, 2007). With reference to the concept of adulthood, the article benchmarks the adult education programmes in correctional centres against the six assumptions of adult learning. Correctional education is the teaching and learning process for adult offenders in their own setting, the correctional facilities. It should therefore comply with andragogical principles/assumptions:

- i) Adults’ self-concept
- ii) Adults’ motivation to learn
- iii) Adults acquire learning for immediate use
- iv) Adults’ orientation to learning
- v) Adults’ use of prior learning
- vi) Adults’ self-directedness

As a person matures, their self-concept moves from being a dependent personality towards one of self-directing human beings, current literature (Knowles, Holton & Swanson, 2015). The theory of andragogy postulates that the adult thus becomes a self-directed learner who does not need rigid control but guidance and support to achieve a specific learning goal (Quan-Baffour, 2011). In correctional settings, if inmates make decision to improve their educational status, it is assumed they are aware of their self-concept or self-being as individuals and as volunteers in their learning and thus intend to be self-directed. Knowles, *et al.* (2012) posit that adult learners come to learning with a repository of knowledge they have acquired informally, formally and non-formally. This prior experience presents a wealth of

resources that can be tapped to enrich the new learning. The fact that inmates have taken initiative to improve their knowledge and do a constructive activity, those with prior knowledge built from it. Adult learners would join in learning activities when they aspire to learn, not because Correctional Services is offering them such opportunities. The saying, ‘You can take a horse to a river, but can’t make it drink’, is relevant here. If adults are not ready to learn and change their situation, they cannot be forced to do so because adults are volunteers of their own learning. The essence of andragogy is the self-direction of learners to become autonomous in directing their learning. Knowles, *et al.* (2012) see self-direction as part of a natural progression from the dependency of childhood to independence in adulthood.

Studies in the Serbian correctional facilities (Montross & Montross, 1997) revealed that most inmates in Russia had basic to secondary schooling while only a few had gone to higher educational institutions. Countries still face the challenge of some inmates who are not keen on enrolling in educational opportunities offered. The main reason cited is lack of motivation. This characteristic and perception can be expected in this study where offenders might indicate similar sentiments. Inmates would have various reasons that motivate them to learn. Such reasons may include filling the gap created mostly by socio-economic conditions of the past. This may apply particularly to those who missed out on education for political and historical reasons in South Africa. Some reasons may be the quest for more knowledge, boredom in prison, or being pushed and forced by authorities in anticipation of future employment prospects envisaged after incarceration. Sometimes the motivation may be the acquisition of free education and its accessibility in correctional facilities. In this article, it is assumed that technology and availability of computer-induced learning could be a motivating factor. Quan-Baffour (2011) and Johnson (2015) submit that andragogy in adult learning provides for immediate application of specific knowledge and skills to solve problems now and not for the future. The learning orientation of adults therefore shifts from subject-centred to one of problem-solving or task-orientation which is why adult teaching and learning must be based on problem-solving through practical solutions such as the use of technology and computers for learning.

2. Research Questions

- i) What student support system does correctional environment provide for higher education student inmates?
- ii) What is the impact of technology-use through computer-hubs in enhancing inmates’ distance education in correctional environment?
- iii) How does the Department of Correctional Services benefit from educational partnerships with institutions of higher education such as UNISA?

The objectives of the study were to establish the student support system offered in correctional education setting for higher education institutions’ inmates. The study was to explore the UNISA’s experience with distance learning through the use and enhancement of computer-hubs established for inmate-students, and lastly to establish the impact of

partnerships between the Department of Correctional Services and institutions of higher education, with particular reference to UNISA and services offered for students-inmates.

3. Methodology

The study adopted a qualitative approach to research. A case study of one UNISA-hub at the Kgosi Mampuru Female Correctional Centre in Gauteng Province, South Africa was used to provide an in-depth analysis. Creswell (2014) describes a case study as an entity defined by time and activity where data collection procedures are used over a sustained period of time. This study was based on UNISA experiences at the facility that had 350 female inmates, of which 90 participated in formal, non-formal and informal educational programmes. At the time of the study, there were 16 undergraduate and postgraduate female inmates studying with UNISA and they all participated in the study (10 under-graduate and 6 postgraduate). Four correctional official-educationists and one UNISA official in charge of examination and student support were also interviewed to share their experiences with the use of hubs at the centre. Thus, 21 respondents participated in the study.

The 10 female inmates interviewed were studying in the following disciplines Law, Mathematics, Education (2), Nursing Education, Computer Programming, Leadership & Management (2) and Social Work (2). Six participants were pursuing their postgraduate studies (4 Honours; 1 Masters and 1 PhD) and four were undergraduates in Social Work, Education, Leadership & Management and Computer Programming. Their narratives were based on the benefits they gain from computer and internet use in the execution of their studies. Seven of the 16 women had experiences of both worlds – where they studied before the hubs were instituted and after. Their narratives enriched the findings of this study as they were able to compare their past and present experiences. The narrative analysis was used to relate their experiences.

4. Results

Table 1 gives verbatim interviews with the 10 inmates in relating their experiences with the new computer hub in their centre.

Table 1: Verbatim interviews

Disciplines	Verbatim interview accounts
PhD in Law	I have been in prison for a long time and I still have a long way to go, unless I get parole. I have kept myself busy by studying up to this highest level as I have never given up that one day I will be released and able to practise as a lawyer and defend other inmates. If I don't see the light of the day, my fellow inmates would still benefit from my knowledge as I intend on defending those who cannot afford lawyers out there. I currently teach/facilitate learning here to undergraduate students in various disciplines. I do get small gratuity which I have been able to buy a laptop, but conditions for its use were very strict and security-controlled as I could only access it if a security guard was available to monitor my use. Sometimes I would

Disciplines	Verbatim interview accounts
	request it and only be given it after a long time.
LLB (Honours)	I miss my freedom but have lived and used my time here fruitfully. I have been able to buy myself a laptop that I use with the permission of the authorities here under close monitoring, as they do not allow internet use.
B.Ed Mathematics (Honours)	Since I am going to be here the rest of my life, I hope the efforts I am making by teaching other inmates in Mathematics will benefit them when they are free. Maybe my stay here will have rippling effects for young people who wish to take Maths to the next level. My life now is focused on serving others. I was excited about the computer-hubs because they would really facilitate our learning goal in providing support that we desperately need as distance learners in challenging prison environment.
B. Ed. Degree	I intend to qualify as an English teacher when I am released. I have enjoyed teaching other female inmates here in prison. After my undergraduate I wish to continue with postgraduate studies while I will hopefully still be working to support and maintain my family from within the four walls. Before coming here, I had no idea of teaching but I have since enjoyed teaching adult inmates and wish to apply for a job and continue teaching inmates even after my sentence. I have enjoyed working with inmates. I will apply to teach after my graduation if I am still here; after release I will apply for a teaching position in one of the schools, and if I am lucky, one correctional centre hopefully will employ me as a teacher. I never dreamt of having access to computer for my studies while here because I never owned a laptop and never bothered to ask the officials. Some of them are very rude when we asked, so now we will have no problem with their bad attitude towards us.
B.Ed. Leadership & Management	While the gratuity is very little, at least I was able to purchase books and a laptop for my studies. We are better than other inmates who don't have monthly gratuity. I was able to save a little bit of money and my family helped me to buy a laptop for my research project studies. After my release, I hope to look for a job – something I never did before as I did not have any qualification. I had to struggle in order to survive, hence I landed here. Now I am going back to be with my family and will earn and live a decent life. The laptop had severe restrictions but with computer hub, the security is better organised and we are given ample time to work on computers and access internet.
Leadership & Management (Honours)	I started studying at ABET level 4; done Grade 12 and started my certificate and diploma. After Honours, I wish to continue to Master's. I dream seeing myself owning a company where my leadership and management knowledge and skills shall be applied. I don't want to bother myself looking for employment because I know no one would employ a person with criminal record, no matter how hard I can try and convince the world. I want to be an entrepreneur and be self-employed. Access to internet will enable me in writing portfolios and research assignments; something I never did correctly as I had no resources. My marks were always low because my portfolios and projects were more imaginative than real. Surfing the internet will give me ideas for my assignments.
Master's in Nursing	I look forward to reintegrating soon with my family, my community and being able to work again as a nurse. Our library has no academic nursing books, so when writing assignments, I did not have many books to rely and learn from. I asked the authorities here to purchase more books but in vain. Sometimes when my husband visited, I would ask him to buy me books or bring my old ones at home, which most of them were outdated. Through the computer hub, I have started downloading many reading material from the internet and my assignments are better written now than they were before. I am grateful to DCS and UNISA partnership as many inmates who were demoralized from studying are now motivated to start and use

Disciplines	Verbatim interview accounts
	computer, some for the first time they want to study through UNISA.
National Diploma: Computer Programming	I am excited about being released and have applied for parole. My educational achievements hopefully will help me to get it. I can't wait to get my freedom and start working for my children, who missed me for these 8 years. Here most women do hair-dressing courses, Early Childhood Development and those other courses considered to be female professions. I have gone against the norm by doing computer programming. I will be able to re-start my life. With the presence of the hubs, one can only imagine how excited I am to be benefitting from them.
BA. Social Work	I am starting with my studies in social work and hope to be academically equipped to address the victims of a problem that brought me here in the first place, drug addicts, robbers and all victims of social ills. My life experiences would help me in my studies as I could relate better with the problems addressed in social work. I have come at a better time when computer e-learning is instituted and I am therefore lucky, as it will make learning easier and fun. In fact, it has motivated to immediately enrol when I came in here. I could imagine how challenging it was for fellow inmates who learned without computers.
BA Social Work (Honours)	I started my studies without the use of a computer and it was extremely difficult. How I have passed my first years of study was still a miracle. I raised some little money and my family met me half-way and I got my laptop. I thank them. I am doing BA Honours and I am excited because I will complete my studies within shortest possible time and proceed to Master's. I hope by the time I leave the facility, I would have acquired my degree and be able to look for a job after my release or start providing services as a consultant. The start of the UNISA-hub marks the beginning of bigger achievements for offenders.

Of the 16 female inmates furthering their studies in different disciplines only four had personal laptops. They expressed frustrations with having to study with limited access to computers, laptops and the internet. Those with laptops obtained them through their families' financial assistance, and through their small earnings as educational facilitators/inmate-teachers. They teach other inmates to complement the few teachers/educationists employed by the DCS. The facilitators also contribute in reducing the shortage of qualified educators within the correctional facilities. Thus, their services as teachers are needed by the correctional facilities.

4.1 Pre- and post-UNISA hubs experiences

UNISA is still regarded as the leading open distance learning institution, with about 80% of enrolments in South African correctional centres being with UNISA. In a focus group meeting with four officials, they agreed that the university provided the offenders with the necessary academic and administrative support for its enrolled students. This is "essential because the institution so far still remains the leading open distance education institution in the country", one official reiterated. Before the hub project came into operation, the female centre did not have computers for use by inmates. But the new computer hub housed 25 computers for use by female inmates, according to one official at the centre.

Another official said, criminals in jails operate in syndicates, and through their networks, they

are able to continue with criminal acts, using computers and the internet. If offenders were caught accessing the internet using 3G modems without permission, they suffered severe consequences, such as being locked in solitary confinement for a day or more. “Fortunately, such incidences are fewer with females than what is experienced in male centres,” one female official interviewed revealed. She added women are not into cyber-crimes like their male counterparts. One official said;

When UNISA introduced online distance education and e-learning, we got worried because we thought we would be left out of the educational system. Granted inmates were struggling with their studies before the hubs, but most of them graduated. Inclusion of inmates in online e-learning has come at momentous time where technology and computer-based or computer-assisted learning is an imperative in educational pursuit.

Before the UNISA computer hub, the department managed to reduce the number of accredited examination centres by centralising examination centres, by making the few existing ones more effective, better managed and resourced. UNISA thus would provide security-vetted invigilators and examinations at the hubs; students registration processes online would thus be facilitated better. Before the hubs, examination process between UNISA and correctional centres was a very cumbersome issue flawed with logistical challenges and compromising the integrity of the examinations written at the centres. “Question papers were delivered days before the examinations due to the complexity of managing examinations inside correctional centres and officials would risk providing security of the papers to avoid leakage”, one official in charge of examinations at UNISA said during an interview. The advantages brought about by the hubs meant that laptops would communicate with UNISA instantly, thus offenders accessing and linking with the LMS more easily than was the case before.

In postgraduate level focus group meeting, inmates, who did not own computers said that before the UNISA-hub project was implemented, said it took them sometimes two weeks to get permission from prison authorities. “That affected my assignments’ submission. I was always late to submit, and the problem was compounded by the fact that study materials arrived late in correctional facilities because of bureaucratic and red-tape logistical arrangements,” (inmate studying at postgraduate level). Sometimes study materials posted to correctional facilities took two to three months to be given to inmates because of the red-tape, thus affecting time to read, study, prepare and write assignments which contribute largely to the passing and throughput rate of the students. The seven who studied before the hub expressed frustrations they used to experience before the UNISA-hub project. They conceded the presence of the hubs is a breakthrough in distance education and correctional distance learning in South Africa. They said they were confident that the pass rates at tertiary level will significantly increase as inmates would have their studies arranged like other students in tertiary institutions.

4.2 Computer-assisted learner- support for inmates

Distance learning alone cannot be seen as the panacea in educational discourse. There have been many contestations on how technology has provided and could continue to support students. Some debates contend that several ways have been provided during the evolution of distance education. Tait (2003) in his article discusses the evolution of technology-based distance learning and how technologists think their innovations are the ultimate technology-tight breakthrough. While computers in correctional services are also seen as breakthrough in including offenders in the contemporary world of knowledge, the challenges were anticipated. The Correctional Services are spending sleepless nights re-thinking their security-proof mechanisms to ensure computers are not misused.

In life, there is never a time that one can be satisfied and say resources and money are sufficient. However, people, companies, organisations and countries have managed to progress despite their limited resources. The same applies with the DCS. Financial challenges are a problem in all countries and correctional facilities. One official in the senior management in one centre said resources in Correctional Services are at two levels: individual and institutional.

O'Neill, MacKenzie and Bierie (2007) in their study conducted on educational programme types in traditional prison and boot-camps, shared similar sentiments with the officials interviewed for this study that resources for any given situation would never be sufficient, but true learning happens if individuals are committed and self-directed (Knowles, Holton & Swanson, 2015). At institutional level, teaching and learning can happen even if there are few resources at organisational and institutional level to do so. Hence it is important for both teams to meet each other half-way. As the saying goes: 'success lies with those who see a half-full glass, not a half-empty one'; and 'it takes two to tango'. One without the other is a recipe for disaster.

Of the 16 inmates interviewed, seven said that some officials treated offenders like animals and not human beings, sometimes being rude, demotivating, arrogant, non-supportive, jealous, and corrupt and fraudsters, but the three spoke highly about some good officials and role-models to offenders. One official acknowledging the talents and good qualities of some offenders, and some good work they do said:

Sometimes we see pregnant women giving birth to beautiful babies in the facilities; they nurse them and nurture them into grown children in this environment. Some offenders, after hard-school work, and after completing their studies, they graduate and celebrate their successes with smiles. We are driven by passion and empathy, and when these success stories happen we

also look back and smile at our achievements together with offenders. We are a Correctional Services family.

This study echoed the sentiments shared in the above quote. As a society, people should acknowledge the efforts and hard work of Correctional Services officials. Regrettably, only the negative things are emphasised. It is the view of this study that the achievements made by Correctional Services and officials should be recognised, and they should continue to be encouraged for their success stories. Peters (2010:158) predicted the use of computers some years ago saying;

The pedagogical goals which are to be pursued through the use of computer networks were all articulated in the 1960s and have remained the same since then, in other words they still apply. The confidence in the impact of computers and computer networks "appears to be practically unbroken".

As some of the inmates in this study indicated during the interviews, they were motivated to realise the student support they got from their educators; then the computer-hubs were additions in terms of motivation for their learning. This confirmed the principle in adult learning where motivation is seen as enhancing adult learning.

In an interview, the assertion by one female inmate who said she joined the educational programmes at a formal setting because she wanted to increase her chances of being considered for parole, demonstrates the impact of parole in inmates' participation in formal programmes. The six principles in adult learning are embraced in such statements as adult learners apply all those basic tenets – they are motivated; self-directed; use their prior learning to advance their current learning and they have certain orientation towards their learning including their self-concept; their learning addresses their immediate needs.

5. Conclusion and recommendations

Institutions of higher learning and the business sector should look for their market in schools and correctional centres, and they should be seen to be providing a supportive role in facilitating financial assistance for the provision of education in these environments by thinking out-of-the-box. The role of tertiary institutions such as UNISA can be strengthened by holding open days to market their services to offenders while also facilitating and ensuring financial assistance. It is therefore recommended that cordial relationships and partnerships with tertiary institutions and private or business sector be created or strengthened where they exist in distance-based correctional education in the facilities.

Increased crime levels in South Africa are a cause for concern for everyone, and a multi-faceted approach and holistic strategies need to be put in place to circumvent the problem which has huge repercussions for the general economy and society as a whole. Provision of

life-skills and corrections in correctional behaviour is a mammoth task that the DCS cannot achieve alone. The use of partnerships with other institutions and organisations has already been mentioned in this article, and it is important to emphasise that again. It is therefore recommended that while the DCS remains vigilant with security protocols, this should not hinder collaboration and partnerships with other stakeholders who are willing to provide innovative life-skills programmes amongst other services. Similar recommendations apply to non-formal education programmes as their positive impact and role in transforming the lives of the inmates are the same. It is therefore recommended that the DCS be more receptive to other stakeholders to partner with them, in accessing educational opportunities. It is evident from the interviews that the presence of the hub is already making a great impression in changing the lives of inmates. Since the hubs are the new phenomenon in the correctional setting, evaluation of its impact will be necessary in the future.

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OPERATIONAL USE OF MOBILE LEARNING IN HELPING WITH UNDERSTANDING AND RETENTION OF COURSE CONTENT

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Abstract

Student learning is influenced by different environmental factors which impact the adequacy of their understanding and retention of course content. At tertiary education level, the intensity and quality of work becomes more physically and mentally demanding. Students may find it more difficult to deal with the workload they are presented with, and as a result, could affect the potential level of understanding they can accomplish in certain subject areas. This study aims to evaluate and explore students' perceptions of mobile phones in helping with understanding and retention of course content. This aim is achieved within a theoretical framework of the use of mobile learning with understanding and retention. This study was conducted on undergraduate students studying Information Technology (IT) at Durban University of Technology (DUT) in 2016. A self-administered questionnaire based survey was used while Transactional Distance Theory is the core theoretical framework that underpins this study. The outcome of students' perception was analysed and it was found that the use of mobile phones in teaching and learning improved their understanding and retention of course contents.

Keywords: M-Learning, Podcast, MP3, Understanding, Retention

Introduction

An aspect that demonstrates mobile learning can be identified as using different features of the mobile phone such as Mp3, voice recordings, podcasting, videos, and pictures which are easily accessible from the internet and can be downloaded directly onto any mobile device, provided the device has internet connectivity. This media can be viewed or listened to at the convenience of the mobile user at any time and place. According to Moseley et al. (1999), it is possible for mobile phones to be more easily integrated across the curriculum than desktops, which is possible since many students already possess mobile phones. A survey by Evans (2008) established that students consider learning materials in the form of podcasts on a mobile phone as an effective learning material, revision tool rather than traditional lectures, self-made study notes and textbooks. It is interesting to note that mobile learning has the power to facilitate changes in the quality of learning modalities which consequently impact educational outcomes (Valk, Rashid, & Elder, 2010). Incidentally, m-learning is more than a mere extension of traditional methods of education; m-learning aids alternative learning processes and instructional techniques that the concepts of new learning identify as effective for learning. It has been recognised that students face a lot of challenges which include time management, inadequate lecture time and understanding of this course content (Valk, Rashid, & Elder, 2010). This is intensified by their inability to balance studying with other day-to-day

activities. More often than not, students find the workload at tertiary education level to be overwhelming. Finding the time to study while trying to complete assignments, homework and personal work have an adverse effect on their studies. The operational use of mobile phones in tertiary education is one of the tools that attempts to improve understanding and retention of course content.

This study aims to uncover students' perceptions of mobile phones in helping with understanding and retention of course content. By understanding their perceptions, it provides a possibility to encourage the incorporation of mobile phones to assist students in improving understanding and retention at university level and to help deal with the above mentioned problems ultimately optimizing students' academic performance.

Hypotheses

Null hypothesis: Students perceive the operational use of mobile phones as a tool for learning to be ineffective in helping improve understanding and retention of course content.

Directional Hypothesis: Students perceive the operational use of mobile phones as a tool for learning to be effective in helping improve understanding and retention of course content.

Rationale

This research needs to be performed to find out students' perceptions of the use of mobile phones in helping with understanding and retention of course content. If the above hypotheses are correct, it will be possible to encourage the use of mobile phones based on the results of the research. The benefits of using mobile phones as a learning tool include 'ease of use', which is the ability to use mobile phones to go over study materials anywhere at the student's own convenience (Evans 2008). For example, a student utilizing his or her time when travelling home on a bus to revise the course content as well as the ability of using camera features of mobiles to take pictures of lecture notes during lectures instead of writing notes down from the board due to the high pace of lecturers. In addition, students are also able to use the voice note features on mobiles to record the voice of lecturers while they speak so they can go over it later and pick up important point they might have missed out during lectures. It is believed that being able to repetitively go over revision work can improve retention of study material. Mobile phones are very compact and therefore very comfortable to carry around. This has an advantage over using textbooks which are much heavier and difficult to carry around (Deal, 2007a). It is easier to use a mobile device rather than textbooks, in terms of searching for pages and sections in the textbook for which you need to study, whereas with podcasts or videos it is possible to just focus on a specific topic without having the trouble of going through a textbook (O'Bannon, Lubke, Beard, & Britt, 2011).

Theoretical Framework

Several theories have been proposed in studying overall frameworks of the developments of technologies in distance education. These theories have focussed on the use of technologies

and their contributions to our understanding of distance education. Amongst these theories, this study places focus on the Transactional Distance Theory as the core of framework that underpins distance education.

Transactional Distance Theory is an educational theory that defines critical concepts of distance learning. It is a concept that describes the creation of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time (Gorsky & Caspi, 2005; Moore, 1993). This interaction comes in the form of technology that helps to reinforce the transaction that fills up the communication space created by the distance (Moore, 1993). According to Garrison (2000), transactional distance theory is "invaluable in guiding the complex practice of a rational process such as teaching and learning at a distance". Hence, this theory is helpful in understanding the perceptions of students with the use of mobile phones in understanding and retention of course content.

Literature Review

The advancements in technology today have created an array of different means for teachers to interact with students (Oyetade & Obono, 2015a). Numerous tertiary institutions have implemented the use of e-learning into their traditional teaching methods. According to Guri-Rosenblit (2005), "eLearning relate to the use of electronic media for a variety of learning purposes that range from add-on functions in conventional classrooms to full substitution for the face-to-face meetings by online encounters". In essence, eLearning helps the students with the freedom of pace, individual study, self-planned learning while the educator/institution provides guidance planning and feedback essential for continued student motivation, participation and course completion (Sewart, 1995; Badu-Nyarko, 2010). eLearning in contrast to traditional lectures, have the benefit of enabling learners to study at their own convenience (When, where and how).

The use of m-Learning naturally inherits the benefits of eLearning but extends its reach, because mobile devices are portable and easily accessible to anybody and everybody (Evans 2008). Kadirire and Guy (2009) defines m-Learning as "a form of eLearning, which can take place anytime, anywhere with the help of a mobile communication device such as a mobile phone, a personal digital assistant (PDA), iPod or any such small portable device".

A key benefit of using a mobile device is that it allows students to study anywhere they prefer and to study "on the go". Other benefits are: flexible and friendly environments leading to improved balance between students course work and their lives; eliminating the demands of a scheduled study time and other commitments on and off campus reducing stress, anxiety and absenteeism; a study tool that makes it easy for students to transport their study material anywhere; unanticipated free time as they regularly have their mobile handsets on them (Nordin, Hamzah, Yunus, & Embi, 2010).

In addition, learners are able to download study media directly to their devices so it is accessible at any given time and place providing greater flexibility to students which is highly beneficial in correspondence learning (McGarr, 2009). Students could also record lectures on their mobile devices and listen to them whenever they want instead of taking down notes. This is beneficial because when taking notes, it may be difficult to take note of course content delivered by the lecturer.

Furthermore, with the other features of m-learning such as podcasting, learning engagements is increased with better completion rates as students can watch videos downloaded to their mobiles and study materials repeatedly which results in higher retention through revision (Mehdipour & Zerehkafi, 2013; Rosell-Aguilar, 2015).

With podcasting, students find it more fun to use their mobile devices to study, it replaces the boring methods of having to sit with books. Other benefits are multi device support as audio and video media are compatible with almost all mobile devices today though some of the challenges faced with podcasting are lack of quality recording as lecturers may be recording the podcasts in an environment that is not acoustically suitable (Park, 2011).

In conclusion, learning in higher education is seen as an individual effort. Most students vary greatly in their learning styles (abilities and disabilities) assimilating at different rates. It is therefore important to assist this students' with the needed tool that would allow them learn at their varying pace and time frames (Knowles, 1970; Badu-Nyarko, 2010)

Current Status of Research

Technology is constantly changing and evolving at a fast rate, there are new ways or forms of media that can be used for learning such as virtual reality. There have been advancements in terms of quality and availability of videos and podcasting. Evidence from literature shows that most studies conducted relating to using mobile devices as a tool for education are done in the developed world (Deal, 2007; Deal, 2007a; Oyetade & Eyono Obono, 2015a). As countries have different standards of education, it is important to conduct this research in the South African context so that we may be able to understand or identify the problem or opportunities for improvement with regards to education.

Research Methodology

Research strategy employed in this study used the quantitative research approach and the method for gathering data was a questionnaire. The total population size of 70 Bachelor of Technology (BTech), IT students from the Faculty of Accounting and Informatics were targeted for the survey. Applying the sample size formula used by (Oyetade & Eyono Obono, 2014) below gives the calculation of our sample size proportion.

$$n = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)} \dots\dots\dots \text{equation 1}$$

N = 70 (Total population), Z = 1.96 (Statistic for level of confidence), P = 0.05 (expected prevalence or proportion) d = 0.05 (Expected level of precision)
 Sample size (n) = 35

Accidental non-probability sampling method was used. The implementation of the accidental non-probability sampling method involved using random volunteers from the BTech Class. A total of thirty five survey responses were obtained. Survey results were analysed using tables, descriptive statistics and frequency response (mode, or percentage of responses). The aim of using frequency response was to observe where there are areas of strong and weak correspondence amongst the results obtained.

Results

The surveyed IT students evaluated the perception of students on the use of mobile phones for educational purposes and use of mobile phones in understanding and retention of course content via an anonymous paper-and-pencil survey. From the survey, insight was gained regarding the students’ perception of the effectiveness of mobile phones as a helpful tool for effective learning.

a. Data Reliability and Validity

A Cronbach alpha was used to provide the measure of consistency scale within the questionnaire. Results from Table 1 show that data collected from students who participated in this study is reliable with (Cronbach’s alpha (α) greater than 0.75).

Table 1: Reliability Table for Research Variable

Research Variable	No of items	Cronbach’s Alpha (α)
Students Perceptions of Mobile Use for Educational Purposes	10	0.95
Students Perceptions of Mobile Use in Understanding and Retention of Course Content	7	0.77

b. Descriptive Statistics

This section provides an overview of the profile of students surveyed in this study.

Table 2: Profile of the Respondents

Demographic Characteristic		Percentage
Gender	Male	60
	Female	40
Age group	17-19	0
	20-23	79
	24-26	13
	Above 27	8
Mobile usage frequency	None	0
	Daily	97
	Weekly	3
	Monthly	0
Ethnicity	African	44
	Indian	50
	Colored	0
	White	0
	Other	6

Table 2 gives an overview of the student's demographics. The study found that a simple majority of the respondents of this survey are males (60%) between ages 20-23 (79%). There is almost a mix of ethnicity between students of Indian and African origin who strongly use mobile phones on a daily basis (97%).

Table 3: Students Perceptions of Mobile Use for Educational Purposes

B	SA	FA	WA	FD	SD	Std Dev	Skewness
B1	62	17	6	6	9	8.7	1.99
B2	43	15	11	17	14	4.6	2.19
B3	49	11	14	17	9	5.76	2.12
B4	46	23	11	9	11	5.59	1.5
B5	51	20	11	15	3	6.61	1.7
B6	40	26	6	17	11	4.76	0.95
B7	43	14	17	17	9	4.71	1.93
B8	51	9	14	17	9	6.34	2.1
B9	65	17	6	9	3	9.26	2.01
B10	71	20	0	6	3	10.54	1.89
Ave	52	17	10	13	8		

Table 3 represents the perceived usefulness of mobile phones for educational purposes by students who participated in this study. Results from this table indicated that students overwhelmingly agree (79%) that the use of mobile phones for educational purpose is effective and useful. Descriptive statistics for individual questions were analysed non-parametrically using the mean. In response to the statement "I think that using mobile phones as an educational tool can enhance my learning in general", the majority of students 85%

agree that mobile phone was useful. Out of the 35 students, 74% of them indicated that it was important for them to be able to access course content through the use of their mobile phones and 65% of respondents indicated that using their mobile phones to acquire their study material was necessary. This implies that in general, the majority of students in this survey overwhelmingly agree (84%) that mobile phones are useful tools for educational purposes.

Table 4: Students Perceptions of Mobile Use in Understanding and Retention of Course Content

C	SA	FA	WA	FD	SD	Std Dev	Skewness
C1	49	23	11	9	9	6.14	1.58
C2	51	17	9	20	3	6.61	1.66
C3	57	23	6	9	6	7.82	1.71
C4	49	23	11	9	11	6.38	1.21
C5	43	29	14	9	6	5.63	0.833
C6	49	31	9	9	3	6.94	0.96
C7	49	14	26	9	3	6.5	1.56
Ave	50	22	12	10	6		

Table 4 represents students' perceptions of mobile phone use in understanding and retention of course content. The results from this table indicated that the students surveyed overwhelmingly agree (84%) that the use of mobile phones is an effective tool that assists with the understanding and retention of course contents. Descriptive statistics for individual questions were analysed non-parametrically using the mean. Results show that 86% of students surveyed agreed that watching YouTube tutorials of course content downloaded on their phones was an effective means of helping them with course content they did not understand. Also, 83% of respondents agreed that watching tutorials of course contents on their mobile phones helps them reinforce learning content they have learnt in class. Overall, the majority of surveyed students (84%) agree that mobile phones are useful tools that assist with understanding and retention of course content. This results tested the hypothesis by comparing how they perceive it as a tool for education and how they perceive in assisting with understanding and retention which show a higher positive deviation in the responses confirming our directional hypothesis. Significantly, most students believed that mobile phones are a useful tool in tertiary education purposes and it does assist in understanding and retention.

Discussion

This study builds on knowledge that majority of students find academic workload in University very demanding. Hence, this paper intended to examine the perceptions of students' on the operational use of mobile learning in helping with understanding and retention of course content. The results section above has provided a general overview of the perceptual experience of students in this respect.

In a nutshell, the results of this study can be presented as follows:

- According to the literature reviewed in this study, transactional distance theory is able to explain the perceptions of students on the use of mobile learning in helping with understanding and retention of course content.
- According to the results of the survey conducted in this study, students perceived the use of mobile phones is effective and useful for educational purpose
- According to the results of the survey conducted in this study, students overwhelmingly agree that mobile phones assist with understanding and retention of course content. This satisfies the aim of this study and confirms the directional hypothesis.
- There seems to be a general agreement between the findings of this study and existing literature on the use of technologies in education. These technologies reinforces or enhances motivation, including self-direction. It also offers a more friendly and -supportive atmosphere than the traditional courses of teaching (BaduNyarko, 2010; Nordin, Hamzah, Yunus, & Embi, 2010).
- This study found that the number of female IT students is very low compared to their male counterparts. Therefore, measures need to be put in place to encourage active participation of female student in academic related activities.

Conclusion

South Africa is a developing country, and as such, faced with challenges that are similar to other developing nations with regards to education. Not all students have personal access to personal computers or laptops, and so using their mobile phones becomes an alternative. Taking advantage of this useful tool can assist in helping students with their academic work. According to the results uncovered in this study, students perceive mobile phones not only as a useful tool for education, but as a means to use it for helping improve understanding and retention. Boundaries of technology are continually expanding and advancing at an exponential rate. With this improvement in mobile technology, it opens endless possibilities of enhancing education in South Africa. Exploiting this mobile technology would be a next step in uncovering the possibilities of improvement in education.

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BEYOND THE HORIZON OF LEARNING PROGRAMMING WITH EDUCATIONAL TECHNOLOGIES

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Abstract

The aim of this research relates to providing a perspective on students' uptake of educational technologies on the virtual learning environment towards effective teaching and meaningful learning to address the challenges of Information and Communication Technology (ICT) education in an Open and Distance Learning (ODL) context. Significant concepts are formulated within a theoretical/conceptual framework, together with a literature review on students' uptake of educational technologies towards effective teaching and meaningful learning, in some cases in ODL contexts. Literature presenting opportunities for further investigation are included. Regarding methodology, the research adopted a non-experimental quantitative research design. The data collection instrument used was a survey, with the sample representing 19% of the population. Details regarding the validity and reliability of the instrument and data analysis are provided. Apart from demographic details, quantitative results are also presented on students' expectations regarding their final marks for this module and their experience of the module, as well as their suggestions towards improving the module. Regarding conclusions, recommendations are formulated regarding the improvement of the implementation of educational technologies for meaningful learning in ICT modules in an ODL context, while considering implications for higher education institutions regarding transforming towards effective teaching with educational technologies.

1. Introduction, purpose and objectives of the paper

Despite the implementation of educational technologies in the Virtual Learning Environment (VLE) towards effective teaching and meaningful learning to address the challenges of Information and Communication Technology (ICT) education in an Open and Distance Learning (ODL) environment, the drop-out rate for many modules remains problematic. This is a problem across the University of South Africa (UNISA), as confirmed by the Vice-chancellor and principal of this higher education institution, during his address of the staff and students: "The drop-out rate is simply unacceptable, and while we know and understand many of the reasons for this, we need to begin to address in a more concerted manner, viable means of turning the situation around" (Magome, 2013). "We were confronted with deeply worrying statistical data on student demographics; a very clear digital divide, a socio-economic milieu which is marked by massive disparities and deprivation, financial constraints, lack of capacity and skills... the list is endless" (Magome, 2013), with some of these possibly contributing towards institutional statistics showing that students are not making use of the educational technologies. The **purpose** of the research reported on in this paper therefore relates to **objectives** with regard to obtaining a perspective on students'

uptake of educational technologies towards effective teaching and meaningful learning to address the challenges of ICT education in an ODL environment.

1.2 Research question

How can the uptake of educational technologies by first year programming students at an ODL University in South Africa contribute towards effective teaching and meaningful learning to address the challenges of ICT education?

1.3 Rationale and Significance of the Study

Whilst doing the literature review for this study, it became apparent that there is a gap in the literature on the uptake of educational technologies in programming modules delivered in an ODL environment and/or related to an African context. The research will therefore address the uptake of educational technologies by first year programming students in an ODL environment specific to an African context. The outcomes of the research will also contribute towards research into the improvement of drop-out rates for first year programming students, as well as improvement of drop-out rates in an ODL environment.

2. Conceptual and theoretical background and frameworks

The theoretical framework is mainly based on the different educational technologies used in the VLE and the contribution these technologies make towards effective teaching and meaningful learning; these are presented together with a number of concepts applicable to the environment within which the research takes place. The research considers how each educational technology is used in the module and then attempts to determine whether the technology is or not used by students and the reasoning behind their use or non-usage of the specific educational technology.

McGill and Hobbs (2008) defined a VLE as “a system that allows for learning materials to be made available to students via the world-wide web. Typical services offered include collaboration and communication technologies; student tracking and maintenance; and assessment blended teaching and learning model”. This is supported by Kashora, Van der Poll and Van der Poll (2014), who expressed the opinion that a Virtual Learning Environment “is a system that allows for learning materials to be made available to students via the world-wide web. Typical services offered include collaboration and communication technologies; student tracking and maintenance; and assessment.”

The Commonwealth of Learning (2005, p. x) defines ODL as combining “two forms of education – open and distance – that focus on expanding access to learning. It is characterised by two factors: its philosophy and its use of technology. Most ODL systems have a philosophy that aims to: remove barriers to education, and allow students to study what they want, when they want and where they want. In short, ODL is about increasing educational access and increasing educational choice. ODL systems typically use technology to mediate learning.” This is supported by Raghavan, Mohayidin and Chun (2015, p. 209), who indicated that the “major differences between traditional on-campus programmes and ODL programmes are the instructional modes being used to instruct students, the degree of

maturation of the two student groups, the physical location of the students, and the degree of responsibility placed on the two student groups.”

Grau-Valldosera and Minguillón (2014, p. 290) affirmed that it “also appears that the definition of dropout is very sensitive to context.” The latter authors’ findings showed that “there are differences regarding the number of consecutive semesters that define dropout depending on whether the programme requires previous experience or not.” These authors also observed “significant differences in the dropout rate between specific programmes”. In light of these findings, drop-out rate for the module ICT1512 used in this research comprises of any student who did not write their final examination in two consecutive semesters.

Chetty and Barlow-Jones (2012, p. 1915) asserted that social “constructivism is a didactic approach that allows learning to take place in a social, interactive and collaborative manner with the intention of students developing skills, such as reasoning, problem solving, the development of higher mental processes and metacognition”, which is in line with what was found by Kozulin, Gindis, Ageyev and Miller (2003).

Siemens (2012, p. 5) maintained that the definition of learning analytics as provided by the Society for Learning Analytics includes the use of techniques such as predictive modelling, building student “profiles, personalized and adaptive learning, optimizing” student “success, early interventions, social network analysis, concept analysis, and sentiment analysis.”

In an ODL environment, the Additional Resources educational technology on the VLE allows lecturers to share documents related to course work, which may assist students with specific topics or exercises. Babu, Ferguson, Parsai, and Almoguera (2013, p. 42) asserted that one of the key lessons they learnt when implementing e-learning was to make additional resources available, as the adequacy “and variety of learning resources determine the success of e-learning programs.”

The Announcements educational technology on the VLE allows for lecturers to send regular communication to students, including e-mails to inform them of similar tasks that need to be completed. One of the advantages of the Announcement technology is that it can be pre-loaded on the system, which allows for messages to be sent on a particular date; unfortunately, students cannot reply directly to the announcements and have to create a new e-mail message should they wish to respond to an announcement.

In an ODL environment, where class sizes for this particular module range between 400 and 800 students per semester, it was found that the Blog educational technology allows for a space where students could keep a reflective diary of what they have studied and give other students, as well as the lecturer, the opportunity to comment on their reflections. This statement is supported by research by

- Ramasamy, Valloo, Malathy and Nadan (2010), on the effectiveness of blogs in a programming course for supporting engineering students;
- Safran (2008), on blogging in higher education programming lectures; and

- Van Heerden and Van der Merwe (2014), who reported on the employment of objective measures in search of a relationship between knowledge blogs and introductory programming performance outcomes.

In the context of programming courses, Porter, Lee, Simon and Zingaro (2011) consistently found that as many as 89% of potential students benefit from peer discussion. The Discussion Forum technology in the VLE provides for a similar type of environment. Lecturers can create specific topic related to work in which students can ask questions or add topics of their own related to the specified topic. Similar to contact classes, all students in a group benefits from the question asked by a student and the answer supplied by the lecturer. The Discussion Forum technology provides the students with the opportunity to create a knowledge community where they can share their learning experiences (Lin, Fan & Wallace, 2013).

The efficiency of study guides have long since been proved (Maxworthy, 1993) and are now merely being updated through the use of educational technologies. The Learning Units educational technology allows for the creation of a study guide that contains multimedia. These online “study guides” can contain any type of resource to accommodate different learning styles to help students progress through their prescribed material.

Mann, Wong and Park (2009) used the combination of “video” and “podcast” to create the abbreviated term vodcast, which, in effect, is the authoring and publishing of visual information. Van Heerden and Goosen (2013, p. 159) found that “the use of vodcasts to teach programming in an ODL environment does make substantial contributions”.

Van der Merwe and Van Heerden (2013) reported on the ease of use and usefulness of Webinar Meetings in an open and distance learning environment. This educational technology allows for hosting presentations on a web server that is controlled by a vendor, it supports multiple audio and video sharing, presentations with extended whiteboard capabilities - such as a pointer, zooming and drawing - public and private chat, desktop sharing, integrated VoIP using FreeSWITCH, and support for the presentation of PDF documents and Microsoft Office documents. Users may enter the conference in one of two roles: viewer or moderator. As a viewer, a user may join the voice conference, share their webcam, raise their hand, and chat with others. As a moderator, a user may mute/unmute others, eject any user from the session, and make any user the current presenter. The presenter may upload slides and control the presentation. Van der Merwe and Van Heerden (2013, p. 269) declared that the webinar technology “is found to be useful for purposes of presentation only, and there is a place for such a top-down approach in the teaching and learning strategy, then that is how it should be used.”

The logistical issues around class tests in an ODL environment are numerous and for this reason, the Self-Assessment educational technology was introduced. The Self-Assessment technology provides self-assessment activities for students to test their knowledge about the module. They are also given immediate feedback on their answers. The synthesis report by Gilbert, Whitelock and Gale (2011, p. 17) on assessment and feedback with technology enhancement indicated that “e-assessment led to a marked improvement in” achievement,

with the added benefit that students are less apprehensive, “since they get regular feedback in how they are doing”. Other literature also supporting the use of this technology includes:

- Antal and Koncz (2011), who studied student modelling for a web-based self-assessment system;
- Bälter, Enström and Klingenberg (2013), who investigated the effect of short formative diagnostic web quizzes with minimal feedback; and
- Matthews, Hin and Choo (2015), who conducted a comparative study of self-test questions and self-assessment objects for introductory programming lessons.

The self-assessments were also created to provide students with the opportunity to prepare for their assignments and their examinations, since the same question pool is used in both cases, thus integrating formative and summative assessment. A further purpose of the self-assessments was to provide lecturers and e-tutors with the opportunity to identify students who are not performing as well as they should (Antal & Koncz, 2011). As an intervention strategy to improve assessment, students who were not participating in the self-assessments, or who were under-performing in the self-assessments, were contacted and offered assistance.

The Schedule technology is where the examination and assignment dates are displayed. Additional dates for tutorial sessions and other types of dates, such as meetings, can also be published here by lecturers. Benda, Bruckman and Guzdial (2012) identified that workload, expectations and time were some of the reasons why specifically novice programmers tended to have problems completing programming courses presented in an online environment.

3. Literature review

3.1 Context

In an attempt to address the high drop-out rate of the module, the lecturer responsible for the module selected a number of educational technologies that are used to enhance the pedagogy of the module and incorporate different learning strategies in an attempt to ultimately improve the performance outcomes and motivate students to make use of the VLE. Students doing the module are required to develop a basic website, adding interactivity to it through object-oriented programming using industry process systems and organizational information systems that conforms to specific standards that are user-friendly and robust, solution specific and to the satisfaction of the client. This skill set prepares the students for a particular vocation and requires a social constructivist approach where students actively participate with what they are studying (Frank, Lavy & Elata, 2003).

The technologies used to enhance the social constructivist pedagogy and to incorporate the different learning strategies of the students include Additional Resources, Announcements, Blogs, Discussion Forums, Learning Units, Meetings, Schedule and Self-Assessments.

3.2 Practical Assignments and Project-Based Learning

Effectively teaching students the concepts of object-orientated programming and writing functional programs prepares them for a particular vocation, and requires a constructivist approach, which is student-centred and requires active participation by the students (Frank, Lavy & Elata, 2003). Project-based learning is ideally suited to this goal, since students actively participate, learn by doing, implement their learning and solve real or simulated problems (Doppelt, 2003), especially when the implementation and assessment of project-based learning takes place in a flexible environment. This type of assessment is more than a mere evaluation of the students' knowledge; it allows the student to show in practical ways that they have mastered the theory and are able to apply it in a real world scenario (Rand, 1999). Project-based teaching, learning and assessment have been and are currently being used by numerous residential higher education institutions as the preferred method for effectively teaching and assessing programming modules (Todorova, Hristov, Stefanova & Kovatcheva, 2010; Vega, Jiménez & Villalobos, 2012). While Todorova, Hristov, Stefanova and Kovatcheva (2010) reported on the innovative experience in undergraduate education of software professionals in terms of project-based learning in data structure and programming, Vega, Jiménez and Villalobos (2012) presented a scalable and incremental project-based learning approach for first- and second-year courses. There are several articles, which indicate that there is an improvement in the performance of students taking programming modules when project-based learning and assessment are implemented (Wilson & Ferreira, 2011; Bubas, Coric & Orehovacki, 2012) - Wilson and Ferreira (2011) specifically looked at e-learning and support educational technologies for Information and Computer Sciences.

4. Research methods and techniques

4.1 Research Design

Johnson (2014) indicated that educational research like that reported on in this paper could be conducted using quantitative, qualitative and mixed approaches - while Myers (1997) conducted qualitative research in the field of Information Systems (IS), Safran (2008) carried out an empirical study. The research methodology in this study mainly followed the non-experimental quantitative research design (Babatunde & Low, 2015). "Quantitative research is a process that is systematic and objective in its ways of using numerical data from only a selected subgroup" (the sample) from the population that is being studied to generalise the findings (Maree & Pietersen, 2007, p. 145). The strategy of inquiry followed was that of repeated cross-sectional studies, conducted to estimate the prevalence of the outcome of interest for a given population. Data collected included individual characteristics and risk factors, alongside information about the outcome (Johnson, 2014).

4.2 Data Collection Instrument

The data collection instrument was a descriptive online survey, which was used to provide an accurate portrayal of the entities which influence students' uptake, such as behaviour, opinions, abilities and knowledge of a situation (Babatunde & Low, 2015). The design process included four stages:

- (1) problem definition,
- (2) concept generation,

- (3) concept selection, and
- (4) concept expansion.

The questions, however, fit any stage of the design, with three types of communication considered for each stage:

- (1) peer-to-peer,
- (2) peer-to-group and
- (3) the group as a whole.

Questions in the survey were derived from published work, such as Subotzky and Prinsloo (2011), Liebenberg, Chetty and Prinsloo (2012), and Blevins (2013). Questions were also derived from the Student Module Evaluation (SME) and the work on student retention for programming modules done by Bennedsen and Caspersen (2007).

4.3 Sample and Sampling Technique

The entire student cohort registered for the module at the time of the survey reported on in this paper (801 students) was sent e-mail and SMS invitations to complete the survey. Data collection took place towards the end of the first semester of 2014. Since responses for 107 students appear in the applicable data file, a response rate of 19.4% was obtained. The biographical information from the survey could be compared to the biographical information for the entire cohort obtained from the student system to ensure that the sample that responded is an accurate representation of the cohort.

4.4 Validity and Reliability of Instrument

To ensure the validity and reliability of the research, the ways to control different sources of method bias as highlighted by Podsakoff, MacKenzie, and Podsakoff (2012) were taken into consideration. The predictor measure was provided by the institutional VLE database and the criterion measures provided by the surveys. Common scale properties were used to measure similar constructs, in cases where scale properties are used to measure different constructs, those questions were placed in another section to clearly differentiate the constructs. Whilst setting the questions the following issues identified by Podsakoff, MacKenzie and Podsakoff (2012) were kept in mind: “keep questions simple, specific, and concise; define ambiguous or unfamiliar terms; decompose questions relating to more than one possibility into simpler, more focused questions; avoid vague concepts and provide examples when such concepts must be used; avoid double-barrelled questions; and avoid complicated syntax”.

4.5 Data Analysis

Descriptive statistics (mean and standard deviation) and bivariate correlations could be calculated for the questionnaire. Scale reliability could be established through Cronbach's Alpha. Cluster analysis in SPSS with Schwarz's Bayesian Criterion as clustering criterion

could be used to unveil user types; to achieve this, the use parameters extracted are used as input. Path analyses per usage in the VLE could also be performed to identify the factors contributing to usage of the VLE. Hierarchical linear regressions in SPSS could finally be used in relation to the various associated research questions. Although especially the second author was involved in the analysis and interpretation of data, neither of the authors were involved in collecting any of the data reported on in this paper; it is therefore reasonable to argue that findings and results are presented without any specific bias.

5. Results and Discussion

The majority (105; 98%) of participating students were from South Africa, with one each from Namibia and South Korea.

Table 1: I am repeating the module

Options	Number of Responses	Percentage
Yes	34	32%
No	72	68%

Less than a third of participating students were repeating the module (see Table 1).

Almost two-thirds (69; 65%) of the students expected a pass mark for the module (between 50% and 74%), while a further 28 (26%) of them expected a distinction (75% or more) - see Table 2.

Table 2: What final mark do you expect for this module?

Options	Number of Responses	Percentage
Less than 50%	9	8%
50-60%	36	34%
61-74%	33	31%
75% or more	28	26%

Table 3: Would you prefer if this module was presented as a year module?

Options	Number of Responses	Percentage
Yes	64	63%
No	38	37%

Almost two-thirds (64; 63%) of the students would prefer that this module be presented as a year module.

Table 4: The module workload was appropriate for the time allocated (per semester)

Options	Number of Responses	Percentage
Strongly Disagree	15	14%
Disagree	22	21%
Neither Agree nor Disagree	18	17%
Agree	39	38%
Strongly Agree	10	10%

Almost half of all participating students (49; 47%) indicated that they either agreed or strongly agreed that the module workload was appropriate for the time allocated.

Table 5: My overall experience of the module was positive

Options	Number of Responses	Percentage
Strongly Disagree	11	11%
Disagree	12	12%
Neither Agree nor Disagree	13	13%
Agree	52	51%
Strongly Agree	14	14%

Almost two-third of all participating students (66; 65%) indicated that they either agreed or strongly agreed that their overall experience of the module had been positive.

How can the module be improved?

In reply to the open question above, a wide variety of answers were obtained from students, some of which are discussed next.

Please note that an effort was made to retain students' authentic voice, but 'sanitation' for e.g. spelling and so-called SMS-language was needed. One very positive student "think the module is perfect and everything is" well-outlined. The lecturer "and e-tutor are just" phenomenal "and I haven't even met them" face-to-face. Another student felt that nothing "needs to be improved so far", while one more was not "sure". While one student suggested more "relevant and current topics", another argued that this could be achieved by "not having an examination project, and by cutting down the amount of chapters" that students have to study "for the examination", or by "turning the" examination "project" into "an assignment". Students should "be given enough time to prepare" for the examination "project as they will not be doing only one module". Other asked for a tutor to be provided, who is "willing to give ... information and everything to be explained clearly", including "many examples of what needs to be done". Some students wanted more "practical examples and more" availability "for assistance", as I was "working when the" e-sessions "were being run", while another asked for more "interactive training". Some of the other comments included:

- "I THINK" THERE "SHOULD BE A" FACE-2-FACE "TUTOR WHO WILL SHOW US ... HOW TO PROGRAM", "BECAUSE SOME OF US ARE STILL STRUGGLING", "DUE TO NO ACCESS" TO "LAPTOPS"
- By "making it a year module and arranging (face-to-face) tutorial classes", at least "weekly."
- By "providing (face-to-face) tutor classes for students"
- I "think it" would "be easy if you provided classes", because I still don't understand a "lot of things"

- Assignment 2 and Assignment 3 “should be on writing” programs “that are long enough to increase student understanding. Provided that full year allocation.”
- More “information and a better understanding of the module as a whole”; Not “everyone is already in the IT” environment - so, for some, “this is something brand new and (they) need more time”
- Better understanding; The “amount of information is overwhelming for 1 subject”
- “I would suggest not” two, but three assignments, which cover “certain aspects more adequately. They dump too much information into one assignment and then ... (especially online students)” get “a huge workload”, instead of having time to learn and/or by “providing practical” laboratories (exercises/sessions).

6. Conclusion

The findings obtained by the research reported on in this paper make a **contribution to the field** - this was done by showing how the uptake of educational technologies by first year programming students at an ODL University in South Africa can contribute towards effective teaching and meaningful learning to address the challenges of ICT education. These findings further add **depth of research** and **originality** towards the general factors influencing drop-out rates in programming modules (Bennedsen & Caspersen, 2007) and factors contributing to student retention and success (Subotzky & Prinsloo, 2011). Since the research methodology implemented is quite flexible, it could also be applied in other programming modules within an ODL institution. As suggested by Bozalek, Ng’ambi and Gachago (2013), the implication for higher education institutions, and especially those operating within an open and distance learning environment, is that educational technologies can and should be implemented towards the transformation of effective teaching.

7. References

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STUDENTS' MOTIVATION TO LEARN AND CONSTRUCTIVIST-BASED ENGAGEMENT LEARNING IN BLENDED LEARNING ENVIRONMENT COURSES

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Abstract

Student motivation to learn has received considerable attention in courses offered in the blended learning environment (BLE). BLE courses place more emphasis on cognitive-challenging authentic tasks by engaging students in meaning making of their own learning with consideration of both digital technologies and in-class teaching and learning activities. This study examines the relationship between student motivation to learn and their constructivist-based engagement learning in BLE courses. Student constructivist-based engagement learning embodies strategic influential factors for knowledge construction based on individual experiences and social engagement in the real world. With correlational research design data were gathered from 685 students by administering motivation to learn inventory (MLI) and constructivist-based engagement inventory (CBELI). Three universities offering blended learning courses from five-degree programs were selected. Findings indicate that there were positive significant relationships among student motivation to learn constructs (intrinsic, extrinsic, task value, self-efficacy and test anxiety) in BLE courses. The results further indicate that students' constructivist-based engagement learning entails influential factors for their engagement in BLE courses. Results show that there was a significant relationship between student motivation to learn and their constructivist-based engagement in BLE courses. Therefore, our study adds important information to the growing body of knowledge on motivation to learn and constructivist-based engagement in BLE courses to teachers, educational researchers, students and instructional designers.

1. Introduction

Knowledge construction pedagogies like constructivist-based engagement learning (CBEL) place more emphasis on cognitively challenging learning task (collaborative task), active participation in learning activities (shareable experiences), and students interests and aspirations (personal relevance) while connecting in the specific learning environment. In CBEL, students' opportunities to reflect on their learning is more valuable than a mere limited and passive role for the student (traditional philosophy of learning). However, high rate of adoption and integrating digital technologies, pedagogies and in-class methods of teaching and learning have been reported to increase student motivation to learn in newly innovated digital technologies environments (cf. blended learning environment-BLE) (Machumu, Zhu & Sesabo, 2016; Ocaik & Akçayır, 2013; Radosavlevikj, 2016). Furthermore, although student motivation to learn a course in specific learning environments had been widely researched (Cetin-Dindar, 2016; Schober, & Keller, 2012), student motivation is still

an important factor for successful student CBEL. Henceforth, understanding the relationship between student motivation to learn and their CBEL in BLE courses is an important consideration to the successful of student learning. However, studies investigating motivation to learn in BLE courses have been focusing on students' achievements goals, effects, self-determination, impacts and goal setting (Dweck, 1985; Zacharis, 2015), thus, studying the relationship between students' motivation to learn and CBEL in BLE courses, especially in a developing country is imperative (Radovan & Makovec, 2015). In this sense, sorely little is known to educational practitioners, researchers, instructional designers, and educators about student motivation in BLE in this context. In this study, therefore, our central concern is on studying the relationship between student motivation to learn and CBEL in BLE courses.

2. Literature review

2.1 Student motivation to learn

In BLE courses, student motivation to learn is an essential and necessary element for successful CBEL. In whichever way, motivation to learn sets the stage for CBEL (Blumenfeld, Kempler, Krajcik, 2006; Schober & Keller, 2012), in which the major challenge for educators is to design a motivating learning environment and challenging course contents that enable the students to end up with deep learning. Alajab and Hussain (2015) argue that motivation plays a significant role in the process of learning. However, over the two decades, substantial body of research on motivation to learn has emerged (Alajab & Hussain, 2015; Barak, Watted & Haick, 2016; Wigfield & Eccles, 2000), most of which documents various contextual variables (intrinsic, extrinsic, and task value) that increases or decreases student CBEL in a course (cf. BLE courses). Moreover, our study, take account of the four motivation to learn categories including intrinsic goal orientation, extrinsic goal orientation, self-efficacy (Bandura, 1997), task value, and test/exam anxiety (Elliot & Harackiewicz, 1994), because they are widely researched in educational settings and seem to relate to CBEL (Elliot & Harackiewicz, 1994; Ryan & Deci, 2000; Radosavlevikj, 2016). Because of the fact that in CBEL learning student share information, knowledge as they construct meaning and if not motivated they won't engage in the authentic meaning-making. Students' passion relates to students' intrinsic goal, learning outcomes and desires to constructively engage in learning (Radovan & Makovec, 2015). That is the relevance of the BLE courses, the design and the way the courses are delivered influence students' motivation and in turn how they engage in CBEL for success meaning making.

However, when setting BLE, instructional designers should consider students' interests, preferences because it may lead to deeper CBEL which results in increased skills and knowledge, otherwise the student will end up on surface engagement and hence surface learning (Blumenfeld et al, 2006). Furthermore, Ryan & Deci (2000) maintain that students' ability to succeed in a course (cf. BLE course) relate directly to his/her self-efficacy. That is, feeling of competence, efforts, persistence, and use of CBEL strategies depend on how teachers model student thinking, provide constructive feedback and prepare students for activities (Bandura, 1997; Wigfield & Eccles, 2000). Furthermore, Ritchie (2015) maintains

that students' ability to succeed in a course (cf. BLEs course) relate directly to their self-efficacy. Bandura's (1997) suggests that students with high self-efficacy are more likely to engage in a task or course (cf. BLEs courses) and vice versa to those with low self-efficacy. That is, self-efficacy may predict students' readiness to engage with BLEs courses (McSwiggan & Campbell, 2017). While anxiety being associated with disagreeable, unease emotional response and future events related concerns; studies have shown that test anxiety is a set of phenomenological, physiological and behavioural responses that accompany concern about possible negative consequences or failure in on a test (Aldalalah & Gasaymeh, 2014; Zeidener, 1994). However, in BLE course students are expected to be engaged, determined and responsible so it is possible to argue that they also have low test anxiety that encourages to achieve their learning task and typically demonstrates good performance.

2.2 Motivation to learn in BLE courses

The notion of motivation to learn in BLE courses is increasing in research in higher education, as many universities decided to offer coursework partly taught in online and partly on traditional face-to-face using either Moodle or Blackboard technologies. For example, Alajab & Hussain (2015) found that there was a significant effect on subject's achievement and motivation increase among students engaged in the blended learning strategy. Motivation to learn categories such connect well in BLE course because of its advantages and opportunities for the students to engage in deep learning and authentic learning activities. Moreover, Zacharis (2015) adds that courses offered in BLE employ CBEL strategies through using a variety of pedagogical approaches tend to motivate massive student enrollment (Glazer, 2012).

However, BLE courses range from fully online syllabi with face-to-face interaction to courses in which traditional, face-to-face, classroom instruction is integrated with online components that extend learning beyond the classroom (Zacharis, 2015). Moreover, literature on BLE, strengthen that it is a formal learning environment that combines the advantages of collaborative web technologies and in-class teaching and learning methods (Delialioğlu, 2012; Garrison & Vaughan, 2008) in which students' motivation to learn to connect successfully via CBEL principles. In the context of BLE courses, studies have shown that the combined advantages such as flexibility, digital fluency, personalized learning, cost effectiveness, student data record tool (Lloyd-Smith, 2010; Savery & Duffy, 2011) enhances student motivation to learn, learning outcomes and CBEL and hence deep learning (2013; Xu & Jaggars, 2011). These results correspond with other research showing that students who were taught in blended learning environments had a higher level of motivation to learn than in traditional learning environments (Xu & Jaggars, 2011). Research on motivation to learn in BLE courses examined more about advantages, effects, satisfaction, attitudes, interactions and perceptions (Lloyd-Smith, 2010; Sucaromana, 2013). However, there is a lack of research on the relationship between motivation to learn and constructivist-based engagement learning. Furthermore, understanding this construct adds more value to educators, BLE course designers, and instructional experts.

2.3 Constructivist-based engagement learning (CBEL)

Constructivist-based-engagement learning is an active learning that involves challenging learning activities which stress on student-focused learning with the instructor being an instructional advisor. Similarly, CBEL embraces engaging learners in the meaning making by performing authentic activities in which the same challenge as those in the community (Jonassen (1999)). In CBEL knowledge creation should engage students in critical thinking and authentic task with an emphasis on individually and socially interpretations of experiences in the real world. Authentic tasks are activities that are personally relevant to the students. In this study, we developed the three constructs to measure and describe the level of CBEL (cf. personal relevance, shareable experiences and collaborative task). In practice, successful CBEL exhibits noticeable designed academic collaborative task to encourage, influence, promote and increase students' engagement and hence improve their learning practices (Duffy & Jonassen, 1992). For example, the role of interaction among students and teachers is built on the need of shareable meaning, personal (experiences, relevance, autonomy), resources and promising learning environments.

Moreover, collaborative task enhances students' engagement, knowledge ownership and active participation through shareable contents that enhance strategic instruction. Studies have shown that while working in team student construct knowledge (Xu & Jaggars, 2011). Consequently, shareable experiences promote access to shared information and hence shared knowledge help learners to collaboratively construct shared knowledge based on their own experiences. For example, social and collaborative group work encourages student engagement in planning, problem-solving, teaching-learning practices (Savery & Duffy, 2011; Zacharis, 2015; Zhu & Kintu, 2015). Furthermore, in CBEL students make their own choices, improve their achievement and reflect on their ability to offer direction on their expertise. In this study, collaborative task entails activities that require student interaction, negotiation from multiple perspectives (Radosavlevikj, 2016) and encourage a sharing of constructive ideas that promote a deep understanding and hence co-creation of knowledge (Glazer, 2012; Xu & Jaggars, 2011).

3. Research objectives

The main objective of the research was to study the relationship between student motivation to learn and their constructivist based engagement in BLE courses. More specifically we focus on: a) to investigate student's motivation to learn constructs in BLE courses; b) to examine the extent of student constructivist-based engagement learning in BLE courses, and c) to relate students' motivation to learn and constructivist-based engagement in BLE course. These objectives raised the following research questions:

- i. What are the characteristics of Tanzanian university students' motivation to learn in BLE courses?
- ii. To what extent are Tanzanian university students engaged in constructivist based learning in BLE courses?

iii. How does Tanzanian university students' motivation to learn relate to their constructivist based engagement in BLE courses?

4. Research method

4.1 Design and context

This is a quantitative correlational research design study. Three Tanzanian universities participated in this study. The design of BLE participating Tanzanian universities takes a form of combined in-class teaching and learning methods and e-learning systems (such as Moodle and/or Blackboard- Zhu & Kintu, 2015). Although some universities (cf. under individual teachers' discretion) were using a social network like Twitter and Facebook for blended learning strategy, we focused on the designed institutional learning management system (cf. e-learning systems).

4.2 Participants and sampling procedures

The study involved 685 students from three universities in Tanzania. Among them, 390 (56.9%) were male and 295(43.1%) females. The study involved first-year students 427(62.3%), second-year students 120(17.5%), and third-year students 138(20.1%). Students were randomly selected from five-degree programs which have implemented blended learning including business studies 119(17.4%, economics 24(3.5%), management and administration 224 (32.7%), teacher education 156(22.8%) and ICT and computer studies 162(23.8%). Interestingly, in terms of age 15 (1.5%) were above 20 years, 526 (76.8%) were between 21-30 years, 48 (7%) were between 31-40 years and 8(1.2%) were 40+ years. Constructivist-based learning was the key context of participants' selection and their engagement in BLE courses was measured by their active involvement in e-learning platform and other blended learning activities.

4.3 Instruments and data collection process

We designed survey instruments, which included three parts. First, gauging student characteristics and second, measuring student motivation to learn in which the following subscales were involved intrinsic goal orientation (4-items), extrinsic motivation (4 items), task value (6-items), self-efficacy (8-items) and text anxiety (5-items). The designed MLI sub-scales were developed based on the work of Pintrich, Smith, Garcia and McKeachie (1991); Duncan and McKeachie (2005). The designed sub-scales were used to address the domain specific questions for Tanzanian BLE courses. And lastly, measuring CBELI with the following subscales personal relevance (5-items), shareable experiences (5-items) and collaborative task (5-items). Responses were given on 5-point Linkert-scales anchored by *strong agree* (1) to *strong disagree* (5). Both scales CBELI and MLI were administered at once. Selection of universities was based on two major criteria: having courses taught by blended learning strategy and having e-learning system as a platform for implementing blended learning. Simple random sampling was used to select blended learning courses in which participants were generated. Universities were consulted for research clearance upon providing the objectives of the study. The participants gave their informed consent to

participate in the study. With two research assistants, we distributed questionnaires to student leaders who helped us to collect them later in-class. Students completed questionnaires during class time. Confidentiality and anonymity of participants were ensured and no compensation was offered.

4.4 Data Analysis

Data were coded, arranged and grouped according to research questions. We used a step-by-steps and the factor structure of the items analysis. Descriptive statistics was used to quantify the amount of variation and values of our data set. Correlational analysis was applied to examine the relationships among variables, and multiple regression was conducted to predict motivation to learn constructs on constructivist-based engagement learning constructs in BLE courses. Notwithstanding, the designed instruments (MLI & CBELI) were new (cf. Tanzania context) with some items of MLI generated and modified from the work of Pintrich et al. (1991); Duncan and McKeachie (2005) focusing on Tanzania BLE courses. Because the instrument has not been used before in the Tanzania context, therefore, EFA was conducted to validate the instrument.

5. Results

5.1 Exploratory factor analysis (EFA) and reliability of scales

EFA was used to analyse the item response in the survey for studying both students' motivation to learn inventory (MLI-27 items) and their constructivist-based engagement learning inventory (CBELI-15 items) in BLE courses. For MLI (27 items) the record of .905 in Kaiser-Meyer-Olkin(KMO) shows high confidence in sampling adequacy while Bartlett's test of Sphericity ($\chi^2(350) = 6645.214, p <.001$) which shows that the correlations between items were sufficiently large for principal component analysis (PCA) (Field, 2009). A cumulative percentage of 54.65% of total explained variance was found with five components and an eigenvalue greater than one. For CBELI (15 items) the record of .906 in KMO shows high confidence in sampling adequacy while Bartlett's test of Sphericity ($\chi^2(105) = 3224.080, p <.001$) which shows that the correlations between items were proved good for PCA. The results indicated a cumulative percentage of total explained variance of 51.86% with three components and an eigenvalue greater than one. In both scales (MLI &CBELI) PCA the correlation matrix indicates that the correlation is between 0.3 to 0.8 which show that the survey items correlated well as the loadings of 0.30 is minimal and 0.50 is considered significant to display the intercorrelations (Tabachnick & Fidell, 2012).

These results (cf. MLI & CBELI) assisted in exploring the relationship between students' motivation to learn and CBEL in BLE courses by conducting correlations analysis and multiple regression. In assessing the internal consistency of the measurement tool, we run a Cronbach's alpha test of reliability to both scales CBELI and MLI. For MLI constructs the results showed the following reliability: self-efficacy (.85), test anxiety (.84), task value (.74), intrinsic motivation (.71), and extrinsic motivation (.67). For CBELI constructs the results

showed that the reliability for shareable experiences (.80), personal relevance (.71) and collaborative task (.74).

5.2 The characteristics of Tanzanian university students' motivation to learn in BLE courses

In this study, descriptive statistics is used to present students' demographic characteristics and mean scores and standard deviation of each identified factor in both measurement tools (i.e. CBELI and MLI). The results showed that extrinsic motivation was high (M=4.16, SD=.79), followed by task value (M= 4.11, SD=.64), self-efficacy (M= 4.03, SD=.69), intrinsic motivation (M=3.91, SD=.71) and test anxiety (M=3.01, SD=1.10) among Tanzanian university students engaged in BLE courses (see Table 1).

Table 1 *The Mean and Standard Deviations for each Construct of CBELI and MLI Factors in BLE Courses*

Motivation to learn constructs	Mean	S.D	CBEL constructs	Mean	S. D
Extrinsic (EM)	4.16	.79	Shareable experiences (SHE)	4.06	.70
Task value (TV)	4.11	.64	Personal relevance (PRE)	3.99	.65
Self-efficacy (SE)	4.03	.69	Collaborative task (CLT)	3.89	.72
Intrinsic (IM)	3.91	.71			
Test anxiety (TA)	3.01	1.10			

Furthermore, correlations among the sub-scales of student motivation to learn in BLE courses were analysed. Spearman's rank order correlation analysis was conducted. The results showed that there were a positive statistically significantly correlation to one another ($p < .01$). However, the strongest correlation was recounted between task value and self-efficacy ($r_s = .526$), while the least correlation was established between task value and test anxiety ($r_s = .111$). The result further indicates that there was no statistically significant correlation between intrinsic motivation and test anxiety ($r_s = .046$). Based on these results, it is appealing that students demonstrated high motivation to learn in BLE courses based on some factors while they were less and sometimes not motivated at all. Table 2 provides summary results.

Table 2 *Correlations among Motivation to Learn Constructs in BLE Courses (N=685)*

	1	2	3	4	5
1. Intrinsic (IM)	-	.270**	.438**	.445**	.046

2. Extrinsic (EM)	-	.365**	.388**	.183**	
3. Task Value (TV)		-	.526**	.111**	
4. Self-efficacy (SE)			-	.139**	
5. Test Anxiety (TA)				-	
Mean	3.91	4.16	4.11	4.03	3.02
SD(σ)	.71	.79	.64	.69	1.10

** $p < .01$

5.3 Students' constructivist-based engagement learning in BLE courses

In determining student CBEL in BLE courses, descriptive analysis on each item was conducted. First, we present students' responses based on mean, standard deviation, and cumulative percentage of agree responses (SA+A) of each item, second, descriptive analysis of the identified factors, and lastly correlation analysis among the identified factors. Descriptive analyses were used to present the mean (M) and standard deviation (SD(σ)) to determine the extent of CBEL constructs (personal relevance, shareable experiences and collaborative task) in BLE courses (see appendix 1). The M, SD and cumulative percentage scores of agreed responses (combined agree (A) and strongly agree (SA) scores of each CBEL item assisted in defining their constructivist-based engagement in BLE courses (see appendix 1). CBEL showed that to a large extent students were engaged in shareable experiences ($M=4.06$, $SD=.70$), followed by personal relevance ($M=3.99$, $SD=.65$) and lastly collaborative task ($M=3.89$, $SD=.72$). That is, students, engage in sharing experiences in BLE courses. These results showed that students agreed that they were engaged on CBEL. Furthermore, Spearman's rank-order correlation coefficient was run to determine the extent to which Tanzanian university students were engaged in CBEL constructs. The results further indicated that there were strong, positive correlations among constructivist constructs, which were statistically significant: personal relevance and shareable experiences ($r_s = .495$, $p < .01$), personal relevance and collaborative task ($r_s = .433$, $p < .01$) and shareable experiences and collaborative task ($r_s = .536$, $p < .01$). Table 3 gives a summary of results.

Table 3 *Correlation between Student Constructivist-based Engagement Learning Constructs in BLE Courses*

	1	2	3
1. Personal relevance (PRE)	-	.495**	.443**
2. Shareable experience (SHE)		-	.536**
3. Collaborative task (CLT)			-

Mean	3.99	4.06	3.89
SD(σ)	.64	.70	.71

** $p < .01$

5.4 Students' motivation to learn and constructivist-based engagement learning

Multiple regression analyses were conducted to predict three CBEL constructs from five motivation to learn constructs. For the CLT, the variables were entered (cf. IM, EM, TV, and TA) statistically significantly predicted CLT, $R^2 = .321$, adjusted $R^2 = .316$, $F(5, 679) = 64.096$ $p < .001$ while SE ($p = .135$) was not a statistically significant predictor. For PRE, the variables entered (cf. IM, EM, TV, and SE) were statistically significantly predicted PRE, $R^2 = .237$, adjusted $R^2 = .232$, $F(5, 679) = 42.199$ $p < .001$ while TA ($p = .792$) was not a significant predictor. For SHE, the variables entered (cf. IM, EM, and TV) were statistically significantly predicted, $R^2 = .242$, adjusted. $R^2 = .236$, $F(5, 679) = 43.347$, $p < .001$ while SE ($p = .294$) and TA ($p = .446$) were not significant predictors (see Table 4).

The results further show that IM, EM, TV and TA were statistically significantly predicted CLT with a positive relationship ($\beta_{IM} = .193$, $\beta_{EM} = .262$; $\beta_{TV} = .183$; $\beta_{TA} = .070$), while SE was not a significant predictor ($\beta_{SE} = .065$). The results further indicated that IM, EM, TV, and SE were statistically significant predictors to PRE ($\beta_{IM} = .212$, $\beta_{EM} = .165$; $\beta_{TV} = .127$; $\beta_{SE} = .122$) while TA was not a significant predictor ($\beta_{TA} = -.264$). Also, the results indicated that IM, EM, and TV were statistically significant predictors to SHE ($\beta_{IM} = .160$, $\beta_{EM} = .234$; $\beta_{TV} = .179$) while SE and TA were not statistically significant predictors ($\beta_{SE} = .048$, $\beta_{TA} = .026$). Table 4 provides a summary of multiple regression analyses results of significant and insignificant predictors of student constructivist-based engagement learning in BLE courses.

Table 4 Summary Results of Multiple Regression Analysis Predicting Relationship between Motivation to Learn Constructs and Constructivist-based Engagement Learning ($N = 685$)

Variable	CLT	PRE	SHE
	β	β	β
Intrinsic (IM)	.193*	.212*	.160*
Extrinsic (EM)	.262*	.165*	.234*
Task value (TA)	.183*	.127**	.179*
Self-efficacy (SE)	.065	.122**	.048
Test anxiety (TA)	.070**	-.264	.026
$F_{(5, 679)}$	64.096	42.299	43.347
R^2	.321	.237	.242
R^2 adjusted	.316	.232	.236

** $p < .001$, * $p < .01$

6. Discussions

Our overall results indicate that students' motivation to learn constructs significantly predicts their CBEL in BLE courses and that helping and promoting their success in knowledge construction and authentic learning. The results also show that students who provided positive feedback recounted that motivation to learn was the basis of their CBEL in BLE course. However, while examining relationships among motivation to learn in BLE course, findings indicated that students demonstrate a high level of motivation to learn in BLE courses based on task value, extrinsic motivation, and self-efficacy, intrinsic motivation. However, intrinsic motivation was not related to text anxiety in BLE courses indicating that students with intrinsic motivation do not fear to take the test in BLE courses might be because of flexibility in time and spaces of taking the test. This is in line with George-Palilonis & Filak (2009) who found that blended students made fewer negative statements than expected about anxiety in a blended learning course. Though studies found that internal and external factors like obtaining good grades, interactions, shared knowledge, personal experiences, asking and receiving answers from both teachers and peers has a significant impact on students' CBEL in BLE courses (Sucaromana, 2013).

However, our sample involved students from three universities which cannot be generalized to other Tanzania universities without considering the specific learning contexts. However, we recount on naturalistic generalization (Barak et al., 2016) understanding that specific examples of natural experiences determine meaningful education processes. We recommend that the future research can be beneficial by involving more universities. Our study contributes to the body of knowledge by showing that in BLE courses students are highly motivated by task value, self-efficacy, and intrinsic motivation factors which in turn influence their CBEL. Our study further examined the extent of university students' CBEL in BLE courses by focusing on personal relevance, shareable experiences and collaborative task as a basis of university students' engagement. As described in the results, we found a statistically significant correlation among CBEL constructs. We found that students who shared their experiences and collaborate in solving tasks asserted highest mean followed with personal relevance. Consequently, our findings showed that students are highly engaged in a BLE course that encourages timely feedback on their academic works, shared information, interactions and authentic challenging task. This suggests that students purposeful engage in a BLE course knowing that they will benefit from sharing knowledge and information by performing an authentic collaborative task and if the courses attain to their personal relevance.

As described in the results, constructivist-based engagement learning construct significantly correlated one another indicating a high level of engagement in BLE course, which would be consistent with Ishtaiwa & Abulibdehs' (2012) study which report that activities promoting critical thinking, collaborative learning and self-directedness contribute to students engaged learning. Adding to this, our results shows shareable experiences and collaborative task recounted high significant of student CBEL in BLE courses. This suggests that students' interactions, goals attached to the activities assigned are the basis of their quality engagement

and achievement in BLE courses. As such we recommend that future research on student constructivist-based engagement learning would focus on assessing the design of CBEL activities in BLE courses because would be beneficial for improving student learning skills. Moreover, it would be possible to assess students' readiness to learn in BLE course prior engaging on constructivist-based learning.

Furthermore, the analysed of the relationship between student motivation to learn constructs and CBEL constructs. The results indicated that students were better able to indicate factors that predict CBEL in BLE courses. Our findings further show that all motivation to learn constructs were significant predictors of CBEL constructs with a positive relationship. Our results add to previous studies that examined motivation to learn in computer-mediated learning environments courses and constructivist engagement. Studies found that students' motivation and student-teacher engagement remains the success factor for their engagement learning (Xu & Jaggars, 2011). When relating motivation to learn constructs, results indicate that students with high self-efficacy, intrinsically and extrinsically motivated and stress high value on tasks engaged in BLE courses, thus they shared information and collaborate for successful engaged learning.

Moreover, our results showed that intrinsic motivation, extrinsic motivation, task value and test anxiety determined collaborative task. The result concerning test anxiety corresponds with Aldalalah & Gayaymeh (2014) who studied anxiety levels in blended learning courses and found that moderately anxiety students perform better than low or high anxiety students in blended learning. As such, our study contributes knowledge on motivation to learn in blended learning context course regarding CBEL. However, the results of the current study showed that intrinsic motivation, extrinsic motivation, task value, and self-efficacy were significant predictors to personal relevance while test anxiety was not. This might be because students in BLE courses maintain the constructivist principle of flexibility and engagement rather than being restricted by place and time (Garrison & Vaughan, 2008). As such, we recommend that future research should focus on student motivation and engagement strategies in BLE courses.

However, in this study, we found that intrinsic, extrinsic and task value were significant predictors to shareable experiences. While we found insignificant association on self-efficacy and test anxiety. The results are not astonishing because there is a concept that test anxiety and self-efficacy attain to individual students and can't be shareable and collaborative event. Consequently, it might be this was influenced by the fact that students enrolled in BLE courses are prone to more interactions with peers and teachers which equally reduces test anxiety and increases confidence. Finally, we recommend that in the future studies effort would be made to measure the level of self-efficacy and level of anxiety in BLE courses in comparison with non-BEL courses students.

7. Conclusions

Our study shows a significant relationship between student motivation to learn and their CBEL in BLE courses. This is remarkable progress in the body of knowledge related to development and implementation of BLE courses in a developing country. Based on the results, we suggest the following three conclusions. First, significant relationships were found among motivation to learn constructs, indicating that Tanzanian university students were motivated to learn in BLE courses. That is, although, students were drawn from three universities which register students from diverse regions and districts in Tanzania, they were motivated to learn in BLE courses. Second, in BLE courses, students' CBEL is very promising for knowledge construction and critical thinking in higher education institutions. As such, motivation to learn embodies influential strategic factors for CBEL in BLE courses. Moreover, motivated students are prone to engage in interactions, collaborative task, forum discussions, share information, and experiences which in turn increases their CBEL in BLE courses. Third, motivation to learn significantly predicts CBEL with a positive relationship. Though students who are motivated to learn indicated high engagement in CBEL in BLE courses, and hence knowledge creation.

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Appendice

Appendix 1. Students' Responses on Constructivist-based Engagement Learning in BLE Courses (N=685)

Constructivist-based engagement learning items	M	SD (σ)	Cum. Agree (%)	SA (%)	A (%)	U (%)	D (%)	SD (%)
Personal relevance								
I think critically about ideas in the readings.	4.10	.89	85.9	33.3	52.6	7.0	4.8	2.3
I search for meaning with the issue I have to learn	4.01	.98	84.5	30.5	54.0	5.4	6.1	3.9
I think critically about my own ideas in BLE course	4.06	1.15	79.9	39.9	40	9.6	6.9	3.6
I study course materials in appropriate ways	3.95	1.02	78.4	31.1	47.3	10.7	7.4	3.5
Learning focuses on issues that interest me.	3.83	1.11	77.8	26.6	51.2	7.4	8.3	6.4
<i>Scale Mean(M) and Standard deviation (SD)</i>	3.99	.65						
Shareable experiences								
I make good sense of the teacher's messages	4.13	.92	84.5	38.1	46.4	8.5	4.5	2.5
I try to build concept based on previous ideas	4.13	.88	85.7	35.8	49.9	7.6	4.8	1.9
I ask other students to explain their ideas	4.10	.93	84.8	35.6	49.2	7	5.7	2.5
Other students ask me to explain my ideas	3.97	1.02	80.6	31.7	48.9	7.3	8.6	3.4

I encourage thoughtful reflection on experience	3.95	.96	76.5	29.6	46.9	13.9	7.7	1.9
<i>Scale Mean (M) and Standard deviation (SD)</i>	4.06	.70						
Collaborative task								
I discuss BLE course material with other students	4.13	1.01	84.5	41.6	42.9	5.7	6.4	3.4
Other students encourage my participation.	3.98	1.03	79.1	33.7	45.4	10.4	6.4	4.1
The teacher stimulates my thinking in BLE course	3.93	1.03	74.8	32.3	42.5	13.6	8.9	2.8
Other students value my contribution in BLE	3.91	.98	74.6	29.2	45.4	15.8	6.9	2.8
The teacher models good discourse in BLE	3.52	1.05	60.5	14.2	46.3	21.8	12.7	5.1
<i>Scale Mean (M) and Standard deviation (SD)</i>	3.89	.72						

SECOND LANGUAGE LEARNING THROUGH ACCENTED SYNTHETIC VOICES

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Abstract

This paper presents an approach of developing accented English synthetic voices. Text-to-speech (TTS) synthesis systems are computer-based applications that are used to facilitate second language learning amongst other things. Second language speakers of a target language can use TTS synthesis system to improve their language learning. Most online English TTS synthesis systems are developed using native speakers of English. We are going to adopt an existing speech synthesis toolkit, the Modular Architecture for Research on speech sYnthesis (MARY) TTS engine. Secondary training text corpus was used to develop our training speech corpus. The quality of developed synthetic voices is measured in terms of their intelligibility, similarity and naturalness. The TTS synthesis system developed is focusing on English as spoken by South Africans who are additional language speakers of English. The results in this experiment indicates that there developed synthetic voices has a high level of acceptance in terms of similarity and intelligibility. The developed accented synthetic voices are very beneficial for incorporation into voice enabled software applications that are targeted at non-native speakers of English.

Index terms: Text-to-speech, MARY TTS, non-native

Introduction

Most South African students learn English as a second language in the classroom. We are living in a technology era where technology has invaded our daily lives. Students can use technology to their own academic benefit than only for socialising purposes. Text-to-speech (TTS) synthesis system is an application that takes in text as input and convert it to speech sound. Such synthesis systems are used to facilitate second language learning by second language speakers. For quality synthetic voices and speech synthesis systems, first language speakers of English are used in the development of most TTS synthesis systems, (Malatji, Manamela & Sefara, 2016). With the different accents of spoken English languages in our country by first language speakers, namely, Afrikaners, Coloured, Indian and South African indigenous languages speakers, using only the first language English speakers for the development of synthetic voices in TTS synthesis systems only favours the minority group of speakers. The geographical locations and cultural groups have an impact on the type of accent one carries. Dialects within indigenous languages of South Africa also impact on the pronunciation or accent of a speaker. To assist in second language learning by non-native

students, we can introduce the deployment of special-purpose TTS synthesis systems. Parr (2011) noted that even though learners that are fluent in reading do not find TTS synthesis system helpful but those who struggle to acquire reading skills appreciate the availability of support tools such as speech synthesis systems. The TTS synthesis system has the potential to unlock the ability of academically struggling students by helping them learn a language in a different way.

Information Communication Technology (ICT) impacts our daily lives in one way or another, as such we hope to reach out to the learning youth through this platform. “ICT has become commonplace entities in all aspects of modern day life. Education is a socially oriented activity and quality education has traditionally been associated with teachers having high degrees of personal contact with learners. The use of ICT in education lends itself to more student-centred learning settings. But with the world moving rapidly into digital media and information, the role of ICT in education is becoming more and more important and this importance will continue to grow and develop in the 21st century” (Malatji, Manamela & Sefara, 2016).

The objectives of this research work are outlined as follows:

- Firstly develop non-native training speech data by recording speakers reading sentences.
- Develop a maximum of three accented South African English voices.
- Evaluate the developed voices in terms of intelligibility, similarity and naturalness.
- Recommend on the developed synthetic voices for use by students at universities even by learners from intermediate phase.

Related work/literature review

According to Stodden et al. (2012), a TTS synthesis system has become a more common tool for struggling readers in high schools and colleges. They state that such systems are moreover accepted as tools to be used by students with disabilities. Furthermore, they used the Kurzweil 3000 TTS software which was developed for people living with various disabilities. The results of the study indicated that participants had significantly improved their reading skills by using the TTS synthesis system. Participants were encouraged to increase the reading speed when they get familiar with the synthesis system. The use of a TTS synthesis system has a very positive impact by allowing the students to focus on the content of what is read than be more fatigued.) the use of TTS synthesis systems have the potential to improve reading rate, vocabulary, and comprehension of students (Stodden et al., 2012).

The use of ICT has the potential to improve education experience of learners who resides in rural and remote rural locations and have special educational needs such as being physically disabled or visually impaired (Malatji, Manamela and Sefara, 2015). An additional language wants six to eight years of teaching before it is used as a medium of teaching and learning (Owen-Smith, 2010). In South Africa, most rural schools do not have basic facilities to

coordinate the use of second language as a medium of teaching and learning, (Malatji, Manamela and Sefara, 2015). Public school learners from grade 4 are expected to use English as a medium of instruction whereas their counterpart uses the same language from the first grade to the last grade. South Africa has the potential to improve its educational system since it is hailed to be the biggest e-learning market in Africa, (IDG connect 2016). With the high number of mobile tablets bought for pupils in Gauteng province, this development shows that educational technology is indeed the future for our country. Targeting pupils through this platform will ensure that systems such as TTS synthesis systems are developed and utilised. South African government is investing lot of money in e-learning. This shows how dedicated the country is in improving its education system (Adkins, 2013). If teachers and learners can fully utilise the resources provided to academically enrich themselves, this will have a significant improvement in the standard of the country's education.

English has been noted as one of the major factors that contribute in university dropouts by students whose first language is not English (Heleta, 2017). Lack of strong academic support negatively affects the progress of changing students' lives at tertiary institutions. According to (Heleta, 2017) compulsory and comprehensive programmes aimed at assisting international students who do not speak English as their first language have the potential to assist South African students. Most of South African students have a big challenge academically because of using the English language for learning and teaching since they are second language speaker of English.

According to Spaul (2013), there is an academic challenge for learners who are transitioning to using their African home languages to English as a language of learning and teaching. Based on the South African performance in Progress in International Reading and Literacy Studies (PIRLS) 2011 test for grade fours, the performance of pupils who learn with either English or Afrikaans from grade R outperforms their African languages counterparts.

Meihami (2013) found that the application of a TTS synthesis system has a significant impact in improving language learning. Although the use of native speakers in the development of TTS synthesis systems is said to produce best synthetic voices, however, due to their speech rate and accent, non-native users find it difficult to understand the synthesised speech. As a result, most non-native users lose interest in using TTS synthesis systems. A country such as South Africa has a very big population of non-native speakers of English and this is an opportunity for the development of TTS synthesis systems targeted at non-native speakers.

Motivation

This study is motivated by people from New Zealand, who actually thought that a robot performed better because it used their voice. Watson, Liu, & MacDonald (2013) discovered that even though the task and dialogue that the two robots (one with New Zealand synthetic voice and the other with native English synthetic voice) performed was exactly the same, only the synthetic voices were different. It was also discovered that speech intelligibility is

greatly influenced by the native speaker status of the listener. Listeners relate easily to speech spoken by speakers they share a native language with.

Methodology

Experimental research design was adopted for this work. MARY TTS synthesis engine is used to develop the synthetic voices (Schröder and Trouvain, 2001). The advantage of this engine is that it provides the opportunity to either train your voices using the hidden Markov model (HMM) based or the unit cluster selection. The HMM-based is a good method when you develop synthetic voices for general domain unlike unit cluster selection which is good for limited domain. We chose the HMM-based because it is fast and provides more quality but its drawback is the high volume of training data required. There is no readily available training speech corpus for accented voices, we developed our own training speech corpus by recording different speakers reading the same sentences. Secondary training text corpus is used for recording the training speech data. The training text corpus utilised is obtained from the Carnegie Mellon University arctic project (Kominek and Black, 2003). The recordings were done during different times of the day, in an office using a laptop. Two male synthetic voices and one female synthetic voice were developed in this study. The targeted speakers of the TTS synthetic system were University of Limpopo students between the ages of 18 and 25. The naming of the synthetic voices derive from the first letters of the speakers first and last names. The table below summarises the speakers used in this project.

Table 2. The data collection information for the different speakers use.

Speaker	Recording time (hours)	Sentences recorded	Sentences used	Voice name
Xitsonga female	9.83	1132	1132	ns
Tshivenda male	14.50	1132	1132	vm
Northern Sotho male	8.58	1132	1132	bn

Figure 1 below indicates the two stages of HMM-based speech synthesis adopted from (Zen, Nose, Yamagishi, Sako, Masuko, Black, & Tokuda, 2007). In the training stage, using the speech data from the recordings as our speech database we are going to perform speech analysis. The Mel-Cepstrum and fundamental frequency (F0) will be extracted at each analysis frame using a continuous and multi-space probability distribution, respectively. Then the phoneme HMMs from the speech data will be modelled, and using the Baum-Welch algorithm re-estimation of the context-dependant phoneme HMMs is performed. In the synthesis stage, when text is entered, it will be transferred to context-dependent phoneme labels. Using those label sequence we then create the sentence HMM through concatenating the context-dependent phoneme HMMs. For the speech to be synthesized from the generated mel-cepstral and F0 parameter sequence, we use MLSA (Mel Log Spectral Approximation) filter.

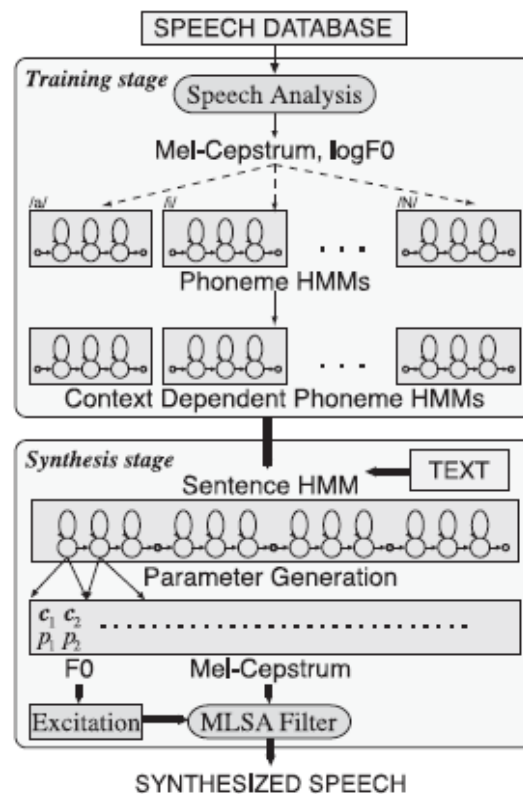


Figure 4. The two stages of HMM-based Speech Synthesis (Zen, Nose, Yamagishi, Sako, Masuko, Black & Tokuda, 2007).

To evaluate the developed synthetic voices we conducted a listening test using the framework from the Blizzard Challenge (Stan, Yamagishi, King, & Aylett 2011). Volunteering evaluators were recruited to evaluate the developed synthetic voices for speaker similarity, naturalness and intelligibility. In speaker similarity, we testing if the synthetic voices developed are similar to the original speakers or not. Listeners were given an original recording and their equivalent synthetic speech to compare. At the end of the listening session they rated the system on a 5 – point scale (1 – sounds like a total different person ... 5 – sounds exactly like the person). In naturalness, we test how natural do the synthetic voices sound. Listeners evaluated the synthetic voices after listening to a paragraph composed of eight sentences read by each synthetic voice and thereafter rate the synthetic voices on a 5 – point scale (1 – completely unnatural ... 5 – completely natural). Unlike the previous tests, intelligibility test requires evaluators write what they heard while listening to the synthetic voices. Different sentences per synthetic voice are used in this test. Similarity and naturalness tests were judged based on the mean opinion score (MOS) of evaluators. MOS was calculated by taking the average of the opinion scores for each synthetic voices. The acceptability of a synthetic voice depends on the opinion of end users. For intelligibility test, we determine the word error rate (WER). WER is calculated as follows:

$$WER = \frac{S + D + I}{N}$$

where S denotes the number of words substitutions made by listener, D indicates the number of deletions of words, I denotes the number of insertions of new words to the sentence and N is the total number of words in the reference.

Results/findings

Sixteen University of Limpopo undergraduate students were used to test the developed synthetic voices. All our evaluators are non-native speakers of English. And the ratio of female to male is 5:3. The Figure 2 indicates the overall MOS for each synthetic voice. We note that the synthetic voice *vm* has a high MOS of 3.875. The synthetic voice *vm* is the most similar voice to its original speaker with 25% of the evaluators saying it sounds completely like the speaker. There is no significant difference between the MOS of the synthetic voices *ns* and *bn* as they both have a MOS of 3.4375. Overall we can conclude that our synthetic voices sounds almost like the respective speakers.

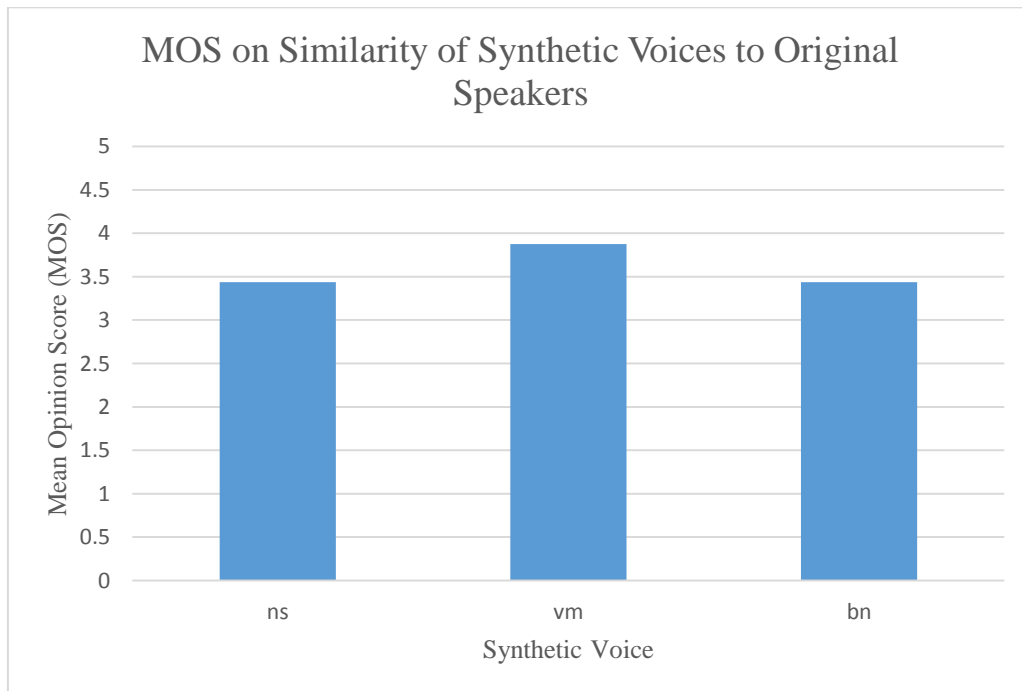


Figure 5. The Similarity MOS for our respective synthetic voices.

Figure 3 indicates the MOS of each synthetic voice according to our evaluators. From the diagram we note that the synthetic voices *vm* and *bn* are closer to the naturalness state with MOS of 3.1875 and 3.3125, respectively. Both synthetic voices *vm* and *bn* had a total of seven evaluators saying they are either natural or completely natural. The synthetic voice *ns* is below average in terms of naturalness with a MOS of 2.6875. Six evaluators said that the synthetic voice *ns* is unnatural.

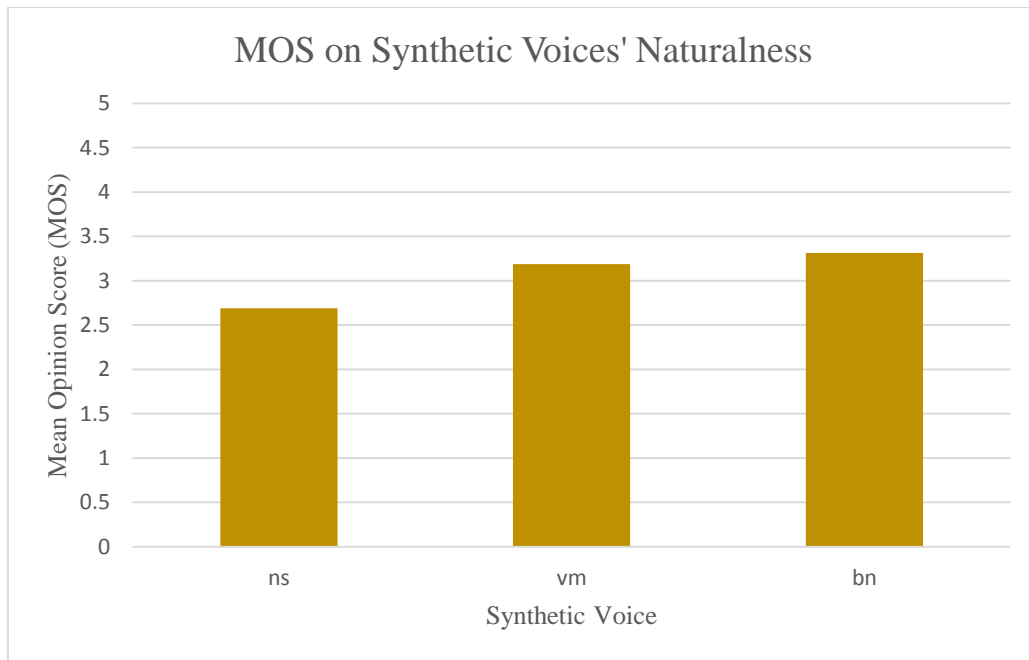


Figure 6. The Naturalness MOS for the developed synthetic voices.

Unlike in the other tests where high MOS meant good results, in the intelligibility test, low WER mean good results. Figure 4 gives a full graphical representation of the WER obtained by each synthetic voice. The synthetic voice *bn* is more intelligible with only 25% WER. Seventy five percent of the words uttered by the synthetic voice *bn* were correctly heard by our evaluators. There exist a small significant difference of 2.57% between the intelligibility of the synthetic voices *ns* and *bn*. Even the synthetic voice that had the highest WER of 29% it was still intelligible. Generally, the three synthetic voices developed are more than 70% intelligible.

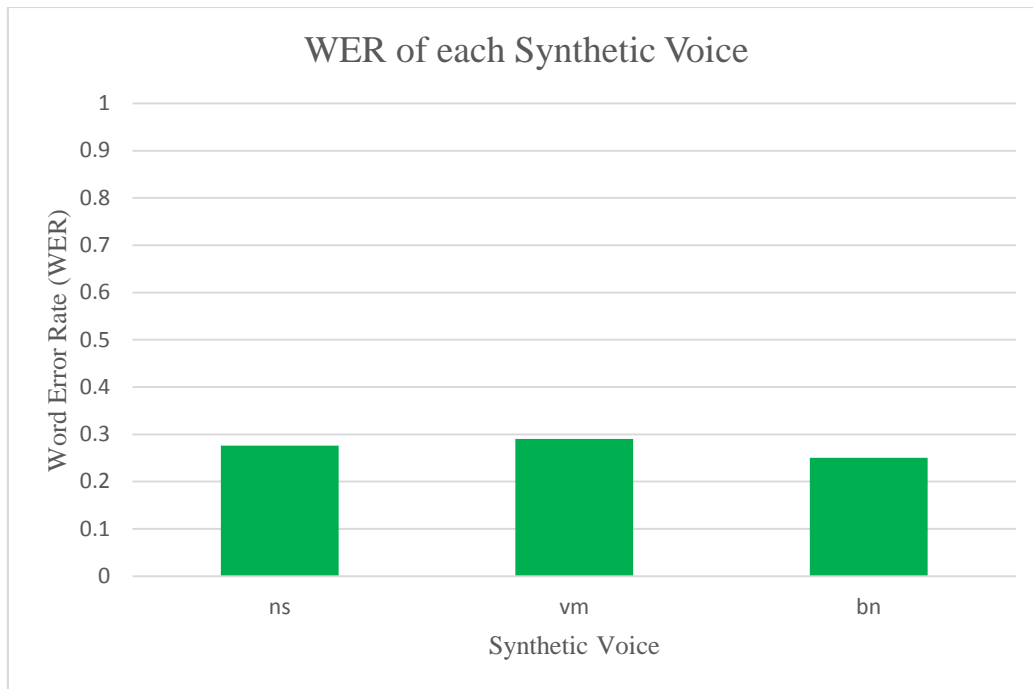


Figure 4. The graphical representation of the Intelligibility test results using WER.

Discussion

From the results we note that the synthetic voice *vm* is more similar and the synthetic voice *bn* is more intelligible and natural than the other synthetic voices. A synthetic voice that is similar to the speaker does not imply that it will be more intelligible. The tests carried out here are independent and do not correlated to each other. The two male synthetic voices surpassed the female synthetic voice in all the three tests except for the intelligibility test. Although there is no significant difference between the WER for synthetic voice *ns* and synthetic voice *vm*, *ns* remains the most intelligible synthetic voice of the two. The use of MARY TTS in developing synthetic voices produced synthetic voices that are more than 70% intelligible to user and with a positive level of naturalness and similarity.

Limitations

The use of unprofessional speakers to collect training speech data yielded more errors in the data collected. We used an office to conduct the recordings which is not a conducive recording environment. Cheap and low quality desktop microphone was used in recording and this resulted in recordings with some unnecessary noise or hiss. The use of an Intel(R) Core(TM)2 Duo CPU E7500 @ 2.93 GHz processor with 2.00 GB installed memory (RAM) desktop. This machine powerful enough for running HTS engines because it takes approximately 7 hours to train each synthetic voice.

Future work

We intend to eliminate all the limitations faced during this study by using professional speakers to collect training speech data. We will also use a professional recording studio to conduct our recording. Since there are no readily available non-native training speech data, we aim to avail the developed training speech data through the University of Limpopo science centre for use by other researchers. Lastly, non-native English speakers in South Africa are a diverse group, we would like to explore all different non-native accents available.

Conclusion/Summary

In this paper, we explained the importance of language learning for non-native speakers. How different people differently comprehend the same speech. We also looked at the importance of accent in speech, the significant role it plays when people communicate. More insight was given on the related work done by other researchers in the field. The method used in developing our TTS synthesis system is given and the TTS synthesis system tools used. We also looked at the characteristics of the speakers and listeners used in developing and testing the system. Finally we looked at the results obtained on using a TTS synthesis system on improving the reading and comprehension skills of three different learners with different reading skills. TTS synthesis systems have a great positive impact on learners with reading problems; it ultimately improves and restores their confidence.

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PRE-SERVICE TEACHERS' ATTITUDES AND PERCEPTIONS TOWARDS USING MOBILE LEARNING FOR TEACHING AND LEARNING

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Abstract

In the 21st century, mobile devices have become ubiquitous, affordable and accessible to different users. Their uses now vary from not just being a means of communication to tools for socialisation, entertainment, work and learning. In schools, many discussions about mobile devices are ongoing as more and more teachers are adopting the technology for use in their classrooms. Teachers' attitudes and perceptions toward mobile learning therefore take an important role in initiating its usage in the classroom. The purpose of this study was to investigate pre-service teachers' attitudes and perceptions towards using mobile devices for teaching and learning purposes in view of their differences in terms of gender, states of having a computer and a smart phone. Data were collected through a survey administered to one hundred and fifty (150) pre-service teachers in a college of education in Nigeria and through interviews conducted with 8 pre-service teachers. Quantitative data collected were analysed using descriptive data analysis and independent sample t-test while qualitative data were analysed using content analysis. The results of this study showed that pre-service teachers' mobile learning attitudes were high in general, although some differences were observed in terms of gender and states of having a computer and a smart phone. These results have some implication for educators, government policy makers and researchers.

Keywords: Mobile Devices, Mobile Learning, Mobile Technology, Preservice Teachers Attitude, Teacher Education

Introduction

Mobile devices have become ubiquitous, and their uses for teaching and learning have grown rapidly in recent years. The discussions around the use of mobile devices in schools are ongoing as more and more teachers are becoming interested in adopting technology for their day-to-day teaching and learning processes. This ongoing debate raises the concept of mobile learning. Mobile learning can be defined as a type of learning where mobile devices such as cell phones, smart phones and tablets are being used as teaching and learning tools. One of its characteristics is that it can be used independent of place and time (Güleroğlu, 2015). Within the classroom context, learners are now using devices such as tablet computers and smart phones to send messages, post pictures, play games, create presentations, interact socially with their friends and learn from each other (Jain & Farley, 2012). As mobile technology is impacting on a large number of students all over the world, it has been used as an advantage in their education. With the use of mobile technology, education crossed over the boundaries

of schools and different opportunities for learning experiences emerged. Furthermore, the use of mobile devices for educational purpose enhances deeper learning and increases engagement during learning (Jain & Farley, 2012; Dunn, Richardson, McDonald & Opreescu, 2012).

According to Fisher & Baird (2006), mobile technology can offer a platform for enhancing active learning, collaboration, and innovation in higher education. Other advantages of integrating mobile learning into teaching and learning include encouraging independent thinking and interaction with the learning material, while allowing the instructor to provide instant feedback on student questions in a large class (Kinsella, 2009). Martin's & Ertzberger's (2013) study established that the overall levels of engagement, excitement, and motivation of students using mobile devices are often higher than students learning the same content using regular computers. Baran (2014) established that mobile learning helps in the classroom interaction and extends it to other locations via communication networks. Also, students receiving content via their mobile devices may often learn more than their counterparts who use regular computers and other learning aids (Thornton & Houser, 2005; Basoglu & Akdemir, 2010). For the teacher educators, the use of mobile devices will shift their role from being content providers at the centre of instruction to facilitators, engaging students as they collaboratively construct meaning around their learning materials (Husbye & Elsener, 2013). Not only does mobile technology allow students to learn anytime and anywhere, but are also changing the structure of classrooms prompting teachers to move away from the traditional teacher-centred style of teaching to more of student-centred style. Using mobile technology in the classroom can encourage learning in a real-world context, help bridge classroom with home environments, improve social interactions as well as provide personalised learning experiences for students. In essence, mobile devices affect the process of teaching and learning and have the potential to advance students' learning. It is therefore necessary that teacher education should keep pace with the use of mobile technology in the classroom. Furthermore, as with other instructional media, teachers play a key role when adopting the mobile learning model in the classroom. Teachers can be presenters, moderators and/or consultants. In order to respond to the students' role of being active participants who are responsible for their own learning processes, the role of the teacher as a facilitator cannot be emphasised. In this role, teachers should be able to identify the learners' interest and relate it to topic related learning goals and the overall learning objectives.

A recent review of the available literature on the application of technology to teaching and learning revealed that certain conceptual and technology-based factors (motivation, attitude, lack of technological sub-structure and so on) influence the application process which eventually affect the quality of learning and academic achievement (Yapici & Hevedanli, 2012). In as much as there are many teachers who are willing to use mobile technology in their classroom, teachers' attitudes toward mobile devices could be a driving factor to facilitate their use in schools. According to Albirini (2006), the success of technology use in

the educational settings largely depends on the teachers' attitudes regarding its use in the classroom. This means that teachers' attitudes towards using the technology for teaching and learning play an important role in the acceptance and actual use of technology for education. Furthermore, the study conducted by Sánchez, Marcos, González & GuanLina (2012) on the teachers' attitudes towards the use of technology in the classroom reveals that teachers' attitudes are highly positive but their actual use of technological tools in class is rare and this is subjected to the innovative processes. These authors suggested that teachers need to be trained on how to integrate technology into teaching and learning.

Attitude is an implicit response, which could be negative, positive or neutral. In order to be able to decide on what attitude an individual develops towards a specific object or event, the individual's response to that object should be observed in various environments (Kubiatko & Haláková, 2009). Attitude towards technological tools has been defined as a person's general evaluation or feeling of favour or antipathy toward technologies and specific computer related activities (Kubiatko & Haláková, 2009). Serin (2012) investigated mobile learning attitudes and mobile learning levels of training teachers at a university in the Turkish Republic of Northern Cyprus according to their departments and gender. The outcome of the study showed no significant difference according to the respondents' department and gender. The teachers on the training were less positive towards mobile learning. On the contrary, a positive attitude toward mobile learning was reported in a study conducted by Güleröglü (2015). In this study, student teachers showed positive opinions on the game-based learning and on the integration of educational mobile games into teaching. Student teachers, as this study revealed, expressed willingness to integrate mobile games in their future profession. In order to fully integrate mobile devices into teacher education curriculum, preservice teachers' attitudes toward, and use of, mobile devices must be better understood. Therefore, this study's aims are to determine the teachers' attitudes toward mobile devices and to find out whether their attitudes toward mobile learning differ or not in terms of their gender, state of having a smart phone, and state of having a computer. In line with this aim, answers were sought for the following research questions:

- What are the attitudes of preservice teachers in Nigeria towards mobile learning?
- Do their attitudes toward mobile learning differ significantly according to their:
 - a. gender,
 - b. state of having a smart phone, and
 - c. state of having a computer?
- What challenges do preservice teachers face when using mobile learning?

Theoretical framework: Social constructivist learning theory and mobile learning

This study is based on Vygotsky's social constructivist learning theory as it relates to mobile learning. In social constructivism, Vygotsky maintains, knowledge is constructed through social interaction and is a shared rather than an individual experience (Vygotsky, 1978). Within a constructivist learning framework, instructors should encourage students to discover principles for themselves. In order to transform learners from being passive

recipients of information to being active constructors of knowledge, instructors must give learners an environment in which to participate in the learning process, and the appropriate tools to work with that knowledge (Vygotsky, 1978). This founder (Vygotsky) of social constructivism emphasises the importance of the interaction with the others such as peer, teachers and parents, to build knowledge. He also emphasises the need for tools such as language and computer to mediate knowledge construction (Vygotsky, 1978). Constructivist learning environments, therefore, should provide rich experiences that encourage students to learn. The aim is to teach big concepts using student activity, social interaction, and authentic assessments (Schunk, 2012).

The adoption of the social constructivist approach in the mobile learning environment and rich technology environments generally promotes the full potential of mobile devices in enhancing teaching and learning (Patokorpi *et al.*, 2007). In a constructivist mobile learning environment specifically designed for learning activities and use of the mobile device as a medium, both teachers and students have new roles. Mobile devices allow students the opportunities for collaboration in the creation of products and for sharing them among their peers (Patokorpi *et al.*, 2007). The advantages of mobile learning can be gained through collaborative, contextual, constructionist and constructivist learning environments (Patokorpi *et al.*, 2007). In designing an effective rich technology environment, we need to be very clear about what we mean by learning and what the desired learning outcomes are in the first place, in order to be able to construct an effective and desirable mobile learning environment. Consequently, in this paper we openly adhere to a social constructivist pedagogy, which helps us to investigate the preservice teachers' attitude as well as their perceptions towards using mobile devices for learning and collaborative activities. Advocates of other learning theories will see these matters differently, but even they will probably find it easier to assess the role and value of the mobile technology and learning content when they have been applied in accordance with a well-defined pedagogical approach.

Method

Research design

This research is descriptive in nature; its key purpose was to describe the state of preservice teachers' attitudes towards mobile learning as it exists in Nigeria at present. Both quantitative and qualitative data were obtained through survey and interview and analysed using descriptive and inferential statistics.

Participants

The participants in this study consisted of 150 preservice teachers in a college of education in Nigeria. This group of preservice teachers was in its second year and was being trained to become science teachers at primary school level. Of these teachers, there were 62 (41.33%) males and 88 (58.66%) females. All the teachers were from the science department.

Instrument

To assess the preservice teachers' attitudes towards mobile learning, the study made use of m-learning survey developed by Uzunboylu and Ozdamill (2011). The 26-item survey was designed to assess the teachers' perceptions of m-learning in 2010 with a population of secondary school teachers in the Turkish Republic of Northern Cyprus (Uzunboylu & Ozdamli, 2011). The response format of the survey was a Likert scale that provides five choices ranging from "strongly agree" to "strongly disagree. The Likert scale questionnaire comprised five points ranking as follows: "strongly agree" (5 points), "agree" (4 points), "neutral" (3 points), "disagree" (2 points), "strongly disagree" (1 point). Cronbach's alpha for Uzunboylu's and Ozdamli's whole scale was .97 and for each of the three factors (classroom strategies/techniques, communication and flexibility/convenience) were .89, .94, and .94 respectively. Since the original scale was designed to assess the teachers' mobile technology attitudes, it is therefore suitable for measuring the preservice teachers' attitude toward mobile learning in this study.

In order to triangulate the quantitative data, the first author conducted a telephonic interview with 8 preservice teachers who showed interest in participating in the interview after responding to the survey. The preservice teachers were asked to express their opinions, thoughts and suggestions about using the mobile devices for teaching and learning purposes. They were also asked to describe how they were using mobile devices to communicate and collaborate with other students as they created personalised mobile learning experiences.

Procedures for data collection and analysis

This study was conducted on teachers in training in a college of education in 2015. A great majority of participants who enrolled in the science department voluntarily completed a paper-based questionnaire which was collected immediately by the first author. Follow-up telephonic interviews were held with a total of 8 participants, so that they would get the opportunity to express their opinions, thoughts and suggestions about mobile learning.

Quantitative data were analysed using descriptive analysis while inferential analysis was done using independent sample t-test to describe the teachers' attitude in terms of different variables. The independent variable was the preservice teachers' attitude, which was coded into high, moderate and low. The maximum scores obtainable were 130 whilst the minimum were 26. Based on the self-developed cut-off points, the scores were considered as High if they were in the upper third of the normative distribution (96-130), Moderate if they were in the middle third (61-95), and Low if they were in the lower third (26-60). Similarly, the obtained mean scores for all items were exclusively summed to develop the cut-off points for the descriptive analyses needed for item by item analysis of the participants' overall perceptions of mobile learning. A t-test procedure was used to compare the means of male and female preservice teachers' attitudes. Also, a t-test was applied to test the teachers' attitudes according to their state of having a smart phone as well as state of having a computer. Data from the interviews were recorded and transcribed in their entirety. Atlas.ti

was used to organise the qualitative data and the systematic content analysis generated a list of codes that were grouped together resulting in emerging themes.

Results

As a result of applying the mobile learning attitude scale to preservice teachers in this research, the scores obtained from the scale were categorised in three groups. While the lowest score obtained from the scale was 26, the highest score was 130. Table 1 shows the attitude levels and the score ranges of these levels.

Table 1: Mobile learning attitude scale score ranges

Scale	Low	Medium	High
M-Learning Attitude Scale	26-60	61-95	96-130

The results of descriptive analyses revealed that the preservice teachers have high attitude ($X=97$) towards mobile learning. This score is almost at the minimum score of high score range. Therefore, there is the possibility that the preservice teachers' interest will continue to increase.

In order to answer the first research question, "*What are the attitudes pre-service teachers in Nigeria towards mobile learning?*" Table 2 indicates the mean average of the preservice teachers' attitude towards mobile learning. There are items such as: *M-learning tools remove the limitation of time and space from traditional resources*, *I can use M-learning techniques as a good discussion tool with my students in the learning activities*, and *M-learning technologies can be used as a supplement in all classes on all subjects with very high mean of 4.09*. The result indicates that the attitude mean of the preservice teachers toward mobile learning is 3.96 which shows that they have a positive attitude toward using mobile learning for teaching and learning.

The second research question examined whether there were differences in the preservice teachers' attitudes toward mobile learning according to their gender, state of having a smart phone as well as state of having a computer. Independent Sample t-test was applied to the total scores on mobile learning attitude scale. Table 2 shows the results of the Independent Samples t-test of the scores obtained by the preservice teachers from the mobile learning attitude scale according to gender.

Table 2: Preservice teachers score from the mobile learning attitude scale

Items and item descriptions	Mean	SD
1. M-learning tools remove the limitation of time and space from traditional resources	4.09	.97
2. M-learning techniques do not generate effective learning-teaching environments	3.97	1.12
3. The Teaching-Learning process should be performed with M-	4.07	1.04

learning technologies.		
4. I can use M-learning techniques as a good discussion tool with my students in the learning activities	4.09	.97
5. Programs such as Messenger and Skype which are used through M-learning tools, provide opportunity for discussions on subjects without the limitations of time and space	4.02	1.03
6. M-learning techniques can be used to supplement or in place of the traditional education	4.04	1.03
7. Most learning activities can be realized by means of M-learning techniques and strategies	3.93	1.03
8. An effective learning environment could be produced by sending lecture notes via M-learning tools such as e-mail	4.06	.09
9. M-learning techniques facilitate teaching the subjects content level Strongly	3.87	1.05
10. M-learning techniques provide an effective method in learning my specialized content/classroom	4.08	.97
11. M-learning technologies provide effective methods for exact transmission of knowledge in learning activities	3.68	1.12
12. Teacher-student communication is facilitated by means of M-learning tools	4.00	1.03
13. Utilization of M-learning technologies increases students' motivation	4.01	.91
14. I can have prompt access to needed materials that are related to my content/grade level by means of mobile technologies	3.76	1.01
15. M-learning techniques are reliable for personal use of learning	3.87	1.08
16. Communication is possible in chat programs by means of mobile technologies Strongly	4.05	.99
17. M-learning techniques are a good method for the necessary interaction in my class	3.95	.97
18. M-learning techniques are convenient to share my specialized knowledge/information with my colleagues	4.04	1.03
19. Course materials could be sent to students via text, video or picture messages Strongly	3.87	1.08
20. M-learning methods enhance the quality of lessons	4.02	1.03
21. I would like to supplement my classes in the future with M-learning methods	3.87	1.08
22. Student-student communication is facilitated by means of M-learning	4.04	1.03
23. M-learning technologies can be used as a supplement in all classes on all subjects	4.09	.97
24. M-learning techniques provide a convenient environment to hold discussions on my specialized content/classroom	3.68	1.12
25. Learners can access instructional websites with mobile technologies	4.01	.97
26. Students can have more effective communication with mobile technologies than traditional methods	3.87	1.05

Table 3: Results of the independent samples t-test of the scores obtained from the mobile learning attitude scale according to gender

Gender	N	Sd.	t	p
Male	62	148	-1.280	0.162
Female	88	150		

An investigation of gender differences (see Table 3) in terms of mobile learning attitude shows that there was no significant difference between the total scores obtained by the preservice teachers from the mobile learning attitude scale ($t(148)=-.390, p>.05$). This finding shows that the gender of the preservice teachers does not cause any difference in their mobile learning attitudes.

Furthermore, Table 4 reveals the results of an Independent Samples t-test of the scores obtained by the preservice teachers from the mobile learning attitude scale according to the state of having a computer.

Table 4: Results of the Independent Samples t-test of the Scores obtained from the mobile learning attitude scale according to the state of having a computer

State of having a computer	N	Sd.	t	p
Yes	73	150	.172	0.712
No	77	149		

The Independent Sample t-test (Table 4) that was performed in an attempt to determine whether there was any difference between the states of the preservice teachers to have a computer and the total scores obtained from the mobile learning attitude scale or not, no significant difference was observed ($t(150)=.172, p>.05$). This means that the state of students having computer or not does not cause any differences in their attitude toward mobile learning.

Table 5 shows the results of the Independent Samples t-test of the scores obtained by the preservice teachers from the mobile learning attitude scale according to the state of having a smart phone.

Table 5: - Results of the Independent Samples t-test of the Scores obtained from the mobile learning attitude scale according to the state of having a smart phone

State of having a computer	N	Sd.	t	p
Yes	79	150	-.857	0.315
No	71	149		

The Independent Samples t-test (Table 5) was performed in an attempt to determine whether there was any difference between the states of the preservice teachers to have a smart phone and the total scores obtained from the mobile learning attitude scale or not. The result shows that there was no significant difference observed ($t(150)= -.857, p>.05$). This means that the state of students having smart phone or not does not cause any difference in their attitude toward mobile learning.

Results from interviews with preservice teachers

The interview data provided additional insights that are important to this research and future research. The interview data enabled the researchers to find out about the preservice teachers' opinions, thoughts as well as challenges about using mobile devices in the classroom. The preservice teachers reported being excited about the opportunity they will have in using mobile device in their classrooms. Regarding the use of the mobile device as a learning tool for the preservice teachers, 5 out of 8 teachers indicated that they always have problems in connecting to the internet and expressed concerns that they need to be taught on how to integrate mobile technology in the classroom. Some students reported that they expected their lecturers to introduce them to the technology while they are still in the college. All the participants interviewed expressed that they will appreciate it if their instructors can help them to understand how to integrate mobile into their instruction in a meaningful way. For example one of the preservice teachers, Teacher A, said:

I don't think we are learning how to use mobile device from our lecturers, I think we are just excited about using it because we are in 21st century where our own student are digital age. I will like our lecturer to include technology integration into our curriculum. This will help us when we start practising as a teacher.

In response to the question, "How are you using mobile devices to communicate and collaborate with other students now?" Teacher B gave the response below.

At the moment, we are using mobile devices to send information to each other in our class through our WhatsApp group. I love the group because I hardly miss lectures or forget to submit assignment now. Using mobile devices for educational purposes is very helpful.

Finally, all the 8 preservice teachers interviewed said that they were so excited to use technology during their first teaching practice. They said they were using mobile devices to engage their learners in the classroom. In all, the preservice teachers have positive attitude toward mobile learning and this group of students have started teaching with technology.

Discussion

From the data presented in this research, it is evident that the preservice teachers are naturally interested in using mobile devices for personal and educational purposes. The scores obtained by the preservice teachers from the attitude scale show that the preservice teachers have high levels of attitudes. The participants in this study are already using technology for their own learning and they are willing to integrate it into their professional practice. The results show that mobile devices actually allow them to study at their own pace. The devices create an avenue for them to acquire the relevant and specific support and give them the opportunity for peer-to-peer interactions. The disposition of the preservice teachers indicates that the use of mobile learning strategy promotes active learning and makes the learning content more

accessible to them. The results confirm that the use of mobile devices for learning allows the preservice teachers to have more time on assigned task and are also able to prepare and study the learning materials several times before discussion in the classroom.

No difference was observed in the attitudes of the preservice teachers toward mobile learning in terms of demographic features such as gender and states of having a computer and a smart phone. Especially the absence of a significant difference according to the states of having a computer and a smart phone is remarkable. This condition could signify that the preservice teachers use their computers and smart phones for activities such as communication and access to the social media rather than course activities. This study is similar to the study conducted by Serin (2012), which also investigated mobile learning attitudes and mobile learning levels of training teachers at a Turkish university. The outcome of the study showed no significant difference according to the respondents' department and gender. However, the general outcome of the study showed that training teachers were less positive towards mobile learning which is contrary to the results of this present study.

In order to integrate mobile devices successfully into teaching and learning, it primarily requires increasing teachers' attitudes toward using the mobile devices in education. The best way of enabling this is to make the preservice teachers get acquainted with mobile learning more closely. This was evident in the results presented above where the preservice teachers were already using mobile devices for their learning activities. Subject areas such as computer education and instructional technologies could cooperate with other departments and enable the use of mobile technologies in the preservice teachers' education.

In the training programmes for teachers, the increase of the mobile learning experiences of the preservice teachers and the observation of the results of these experiences will light the way for researchers to integrate the mobile learning into lessons. Providing mobile devices (tablet computers) for students and teachers from different government programmes is not sufficient for the integration of mobile technologies into education alone. In order to succeed in this integration, the preservice teachers and inservice teachers are required to have the ability of using these technologies, accept the mobile technologies and develop positive attitudes toward these technologies.

Conclusion

Evidence from this study suggests that the preservice teachers have positive disposition toward mobile learning. They express that the strategy promotes active learning and makes the learning content more accessible to them. However, some of the challenges they faced include poor internet connection and power supply, incompatibility of mobile phones, and size of the video lessons. It is therefore recommended that the preservice teachers' curriculum be developed to include the use of mobile technologies in all learning areas. The results of this study show that the preservice teachers were making pedagogical decisions but they were not consciously doing so by drawing on a particular framework. It is therefore recommended

that the preservice teachers would benefit by learning to use mobile devices through a framework such as technological, pedagogical and content knowledge (TPACK). Using this framework will enable the teachers to understand the affordances of mobile devices and how to integrate them into teaching and learning.

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FAMILIARITY, ATTITUDES, UTILISATION OF EMERGING EDUCATIONAL TECHNOLOGIES (EET) AND STUDENT LEARNING ACHIEVEMENT IN MATHEMATICS

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Abstract

The study investigated the contributions of familiarity, attitudes and utilisation of Emerging Educational Technology (EET) to mathematics learning achievement among senior secondary students in Emohua Local Government Area of Rivers State, Nigeria. The total of 310 Senior Secondary School I (SSSI) students took part in the study. Proportionate stratified random sampling technique was used to compose the sample. Two instruments were used to collect data. viz Mathematics Achievement Test (MAT) and Student Emerging Educational-Technology Questionnaire (SEEQ). Three research questions guided the study. The reliability of MAT was determined using Kuder-Richardson (KR-21) whereas that of SEEQ was determined using Cronbach Alpha method to obtain reliability indices of 0.75 and 0.81 respectively. Mean, Standard Deviation, bar graph and regression analysis were used for data analyses. The respective levels of familiarity, attitude and utilisation of EET among the students were found to be adequate. The familiarity and attitude toward EET respectively had positive but insignificant contributions to senior secondary student mathematics learning achievement. However, utilisation of EET had an inverse and no significant contribution to student learning achievement in mathematics. The joint contribution of all the three predictors to student learning achievement was not also significant. It was recommended among others that senior secondary students should try to familiarise themselves with EET because it has a positive contribution to mathematics learning achievement.

Keywords: Emerging educational technologies, familiarity, attitude, utilisation, mathematics achievement.

INTRODUCTION

Mathematics is vital for the scientific and technological development of any nation. The importance of mathematics is the reason Nigeria made it a core subject in her primary and secondary levels of education. However, for some years now the underachievement of students in mathematics has become a recurring decimal. This poor performance has been linked with a wide range of factors, viz low self-efficacy, high anxiety, inappropriate earlier teaching and so on (Munro, 2003). There is a school of thought which holds that when students are taught with the emerging educational technologies their achievement may improve. Boser, Palmer and Daugherty (1998) opined that the paradigms for technology-based teaching are changing. The experts in curriculum and teachers of technology education recommend a wide range of instructional models to inform students about technology and its

impacts on the society. Stakeholders in education in Nigeria have been retraining teachers on the use of educational technology with the hope that this will lead to enhanced student performance.

According to Richey (2008), educational technology is "the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources". Technology has metamorphosed the way 21st-century students learn (Tapscott (2009; Sprenger 2010). Arnold and Pistilli, (2012) showed that educational technology can improve student learning outcomes. Students in the 21st century are extensively exposed to a wide range of media (Geer & Sweeney, 2012; Craft, 2012). Additionally, Dick & Hollebrands, (2011) opined that strategic use of technology is capable of strengthening mathematics teaching and learning. More studies confirm that when technology is used strategically in the mathematics classroom, it is capable of supporting the learning of mathematical procedures and skills and that it can develop higher order mathematical proficiencies viz: problem-solving, justifying and reasoning (Gadanidis & Geiger, 2010; Pierce & Stacey, 2010).

Junco, (2010) opined that increased use of technology will enhance the reception of information by the students and reinforce their performance. On the other hand, a recent study by Blumenstyk, (2015) argue that the adoption of technology in teaching without the processes that conventionally has to do with considerable personal interaction with students in areas such as advising and instruction will weaken student knowledge. Other previous studies found that the adoption of educational technologies approaches in the teaching students did not improve student learning achievement. This implies that instructional models integrating educational technology did not correlate with higher learning achievement score (Hansen & Williams, 2008; Lu and Gordon, 2009).

Boser, Palmer and Daugherty (1998) investigated the attitudes of students toward technology in some selected technology education programmes and found among other findings that student concept of technology and their attitudes towards technology remained consistent with previous studies. Makridou-Bousiou, (2006) explored the effectiveness of technology in teaching high school economics and found that there was no significant difference between the learning outcomes of students taught using blended teaching model and those taught using the conventional method. The study further indicated that most students felt comfortable with the use of technology, 62.2% of those who were in the experimental group claimed to be extremely familiar with using the computers and 37% indicated that they had regular familiarity with the computers. A similar exploration by Williams and Lonn (2004) also showed that students who were taught using technology did not perform better than those who did not receive technology-based instruction; the students were of the belief that their knowledge had increased and that they were comfortable in the use of technology and the teachers reported improved passion about technology use and willingness to spend more time on the adoption of similar programmes.

Theoretical framework

This study is anchored on the theory, Technology Acceptance Model (TAM) which was introduced by Davis (1986). The TAM is an adaptation of the Theory of Reasoned Action (TRA) (Ajzen and Fishbein 1980; Fishbein and Ajzen 1975). The TAM states that two specific beliefs, perceived usefulness and perceived ease of use are of fundamental importance for the computer acceptance behaviour (Figure 1). The TAM further postulates that Behavioral Intention (BI) is a determinant of computer usage. It states that BI is jointly determined by individual's Attitude toward using the system (A) and the perceived Usefulness (U) (Davis, Bagozzi & Warshaw, 1989).

The present study therefore included factors such as familiarity, attitude and utilization of emerging educational technologies because they are of critical relevance in an attempt to predict the impact of the use of EET on student learning achievement in mathematics.

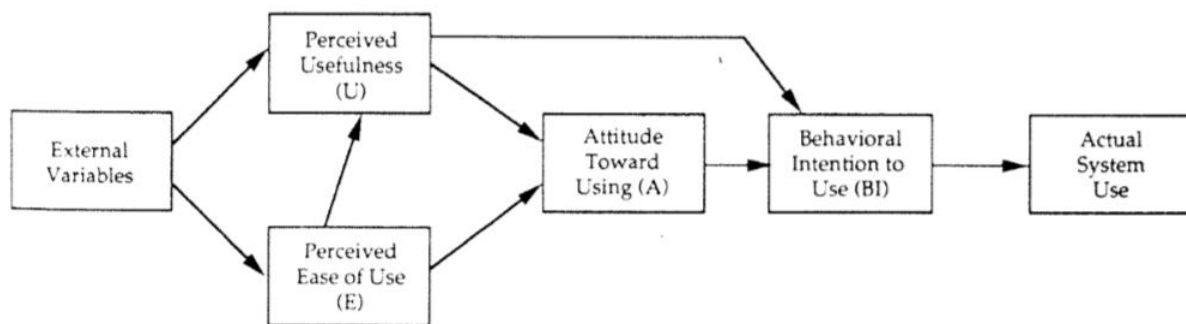


Figure 1: Source: Davis, *et al* (1989), Technology Acceptance Model (TAM)

Statement of the problem

The mathematics underachievement of students in both internal and external mathematics examinations has become a serious issue. Stakeholders in education have devised several means to improve student learning achievement in mathematics. Arnold and Pistilli (2010) established that technologies enhance student learning outcomes whereas the research carried out by Bransford, Brown and Cocking (2000) revealed that technologies do not guarantee effective learning and inappropriate use of this technologies can even hinder students achievements. In line with the foregoing, the present study is an exploration of the relative and combined contribution of familiarity, attitude and utilisation of emerging educational technologies to mathematics learning achievement among senior secondary students in Emohua Local Government Area of Rivers State. The six (6) key emerging educational technologies included in the study were cloud computing, gamification, open content, mobile technologies, learning analytics and personal learning environment. To the best of the researchers' knowledge, no study conducted in the Emohua LGA has investigated the respective and joint contribution of familiarity, attitude and utilisation of EET to mathematics learning achievement of SSSI students in Emohua LGA of Rivers State.

Purpose and Objectives of the study

The aim of this study was to explore the extent to which familiarity, attitude and utilisation of emerging educational technologies predict senior secondary student mathematics learning achievement. Specifically, the study intend to;

1. describe the general level of familiarity, attitude and utilisation of EET among senior secondary students
2. determine the respective contribution of familiarity, attitude and utilisation of EET to the prediction of mathematics learning achievement of senior secondary students
3. investigate the combined contribution of familiarity, attitude and utilisation of EET to the prediction of mathematics learning achievement of senior secondary students

Research questions

The following research questions guided this study:

1. How might we describe the general level of familiarity, attitude and utilisation of EET among senior secondary students?
2. What are the respective contributions of familiarity, attitude and utilisation of EET to the prediction of mathematics learning achievement of senior secondary school students?
3. What is the combined contribution of familiarity, attitude and utilisation of EET to the prediction of mathematics learning achievement of senior secondary school students?

METHODS/ TECHNIQUES

Research design

The correlational research design was adopted in the study. The independent variables were familiarity, utilisation attitude toward EET whereas the student achievement in mathematics was the dependent variable of the study.

Population, Sample and sampling technique

The population of this study consists of all the Senior Secondary School one (SSSI) students in Emohua local government Area, Rivers state, Nigeria. Proportionate stratified random sampling technique was used to select a sample of 310 SSSI students from six (6) senior secondary schools in Emohua LGA to participate in the study.

Instrumentation

Two instruments were used to collect data. viz Mathematics Achievement Test (MAT) and Student Emerging Educational-Technology Questionnaire (SEEQ).

Mathematics Achievement Test (MAT): The Mathematics Achievement Test was a researcher-designed and validated 25-item multiple choice test, with only one correct option out of four options that was used to measure student learning achievement in mathematics.

The reliability of MAT was determined using Kuder-Richardson (KR-21) to obtain a coefficient of 0.75.

Student Emerging Educational-Technology Questionnaire (SEEQ). Student Emerging Educational Technology Questionnaire was also a researcher-designed instrument with three sub-sections that had altogether 30 items used to measure student familiarity, attitude and utilisation of EET. The instrument included the following key EET variables, viz: cloud computing, gaming, open content, mobile technology, learning analytics and personal learning environment. The modified four-point Likert scale was used to quantify these independent variables. The reliability of SEEQ was determined using the *Cronbach Alpha* method to obtain a reliability coefficient of 0.81.

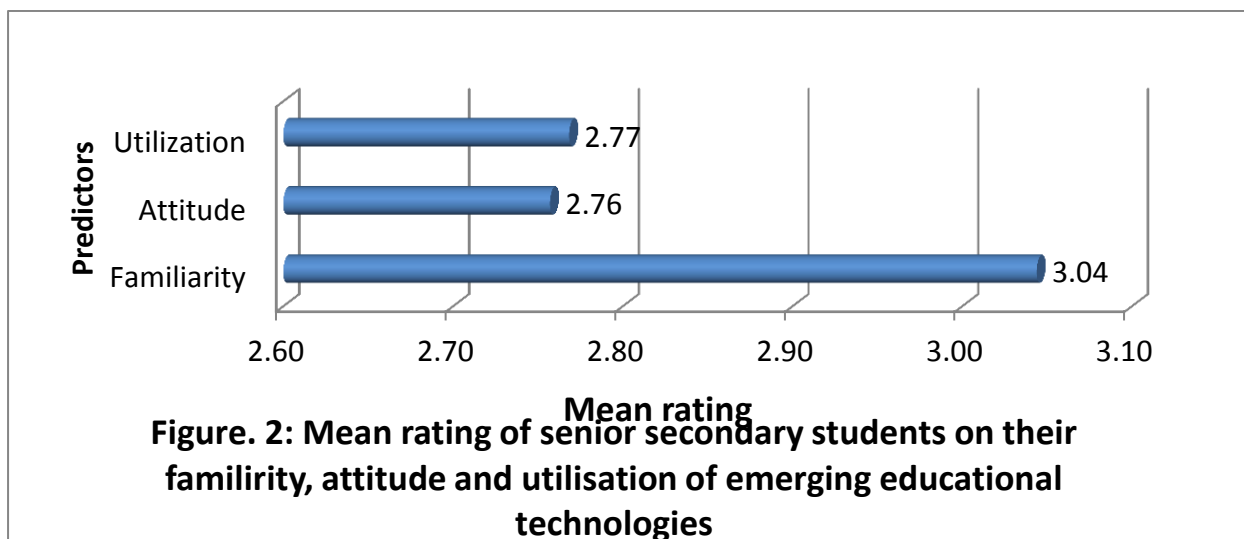
Method of data collection

The data for this study was collected using MAT and SEEQ. Copies of these instruments were simultaneously administered to the senior secondary students in the selected schools in Emohua local government Area, Rivers state, Nigeria. The filled out copies of the instruments were retrieved immediately by the class teachers and the researchers. The responses were scored and coded for data analysis.

Data analysis

Mean, Standard Deviation (SD), bar graph and regression analysis were used for data analyses.

RESULTS



Familiarity, Mean, SD=3.04 ± 0.55; Attitude, Mean, SD=2.76 ± 0.77; Utilisation, Mean, SD=2.77 ± 0.78.

The result from Figure 2 shows that the mean familiarity of senior secondary students with EET was 3.04 ± 0.55 , their mean attitude towards EET was 2.76 ± 0.77 whereas their mean level of utilisation of EET was 2.77 ± 0.78 .

Table 1A: Summary of linear regression on the contributions of familiarity, attitude, and utilisation of EET and student mathematics learning achievement

A: Model Summary

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate
1	.067 ^a	.004	-.005	16.91232

a. Predictors: (Constant), Utilisation(U), Attitude(A), Familiarity(F)

B: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	61.943	7.254		8.539	.000
	Familiarity	.737	1.773	.024	.416	.678
	Attitude	.098	1.248	.005	.079	.937
	Utilisation	-1.404	1.243	-.065	-1.130	.259

a. Dependent Variable: Learning achievement(L)

C: ANOVA^s

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	391.820	3	130.607	.457	.713 ^b
	Residual	87524.119	306	286.027		
	Total	87915.939	309			

a. Dependent Variable: Learning achievement

b. Predictors: (Constant), Utilisation(U), Attitude(A), Familiarity(F)

Part B of Table 1 shows that the relationship between of familiarity, attitude, utilisation of emerging educational technologies and senior secondary student mathematics learning achievement was very low but positive ($R=.067$). The R-square value of .004 in Part A of Table 1 showed roughly a 0.4% joint contribution of mathematics familiarity, attitude and utilisation to EET to mathematics learning achievement among senior secondary schools. The relative contribution of each of the three predictor variables based on their Beta-values were .024, .005 and -.065 respectively for familiarity, attitude and utilization of EET. Considering the t-values, none of the three predictors made significant contribution to learning achievement. The regression equation, $L=61.943+0.737F+0.098A-1.404U$ indicated that any increase in the familiarity and attitude towards EET are likely to lead to an increase in mathematics learning achievement, however, a decrease in the value of utilisation may lead to an increase in mathematics learning achievement. The ANOVA results in Part C of Table 1 showed that the combined contribution of familiarity, attitude and utilisation of EET do not

significantly predict mathematics learning achievement of senior secondary school students ($F(1, 306)=0.457, p>0.05$). .

DISCUSSION

The mean level of familiarity, attitudes and utilization of EET among senior secondary students

The result as reflected in Figure 2 showed that the mean familiarity of senior secondary students with EET was 3.04, $SD=0.55$, their mean attitude towards EET was 2.76, $SD=0.77$ whereas their mean level of utilisation of EET was 2.77, $SD=0.78$. Since the mean scores of the students on the three predictor variables were above the criterion mean score of 2.50, it implies that they were familiar with EET, their attitude towards EET was positive and their level of utilisation of the technologies was adequate. It is worthy of note that the familiarity of the students with EET was rated highest among the three measured variables. This study is in agreement with Makridou-Bousiou, (2006) which established among other findings that most students felt comfortable with the use of technology in learning and majority of those who were taught using technology-based model claimed to be extremely familiar with using the computers.

The respective contributions of familiarity, attitude, and utilisation of EET to student mathematics learning achievement

The result as shown in Part B of Table 1 showed that the familiarity with EET did not make any significant contribution to the student learning achievement, however the observed relationship was positive ($Beta=.024, t=.416, p=.678$). The findings of the present study are also consistent with an earlier study by Makridou-Bousiou, (2006) which established that there was no significant difference between the learning outcomes of students taught using blended teaching model and those taught using the conventional method.

The result from Part B of Table 1 also showed that attitude towards EET had a very low, positive and insignificant contribution to mathematics learning achievement among senior secondary students ($Beta=.005, t=.079, p=.937$). The present finding corroborates the findings of Boser, *et al* (1998) which explored the attitudes of students toward technology in selected technology education programmes and found among other findings that student concept of technology and their attitudes toward technology remained consistent with previous studies.

The result from Part B of Table 1 showed that utilisation of EET had a low, negative and insignificant contribution to mathematics learning achievement among senior secondary students ($Beta=-.065, t=-1.130, p=.259$). The result of the present study corroborates with the findings of Branford, *et al* (2000) which established that technologies do not guarantee effective learning and that inappropriate use of these technologies can even hinder student achievement. Hansen & Williams, (2008); and Lu and Gordon, (2009) also established that

the use of educational technologies approach in the teaching students did not improve student learning achievement.

The joint contributions of familiarity, attitude, and utilisation of EET to student mathematics learning achievement

The result on Part A of Table 1 showed that correlation of all the predictor variables: familiarity, attitude and utilisation of EET and learning achievement was .067. The regression analysis on Part C of Table 1 showed that the combined contribution of familiarity, attitude and utilisation do not significantly predict mathematics learning achievement of senior secondary school students ($F_{1, 306}=0.457, p>0.05$). The result of the present study is at variance with the findings of Dick & Hollebrands, (2011), Pierce & Stacey, 2010, and Gadanidis and Geiger, (2010) which established that strategic use of technology is capable of strengthening mathematics teaching and learning.

CONCLUSION

The levels of familiarity, attitude and utilisation of EET among senior secondary students were encouraging. The familiarity and attitude toward EET relatively had positive but no significant contributions to senior secondary student mathematics learning achievement. However, utilisation of EET had an inverse and no significant contribution to mathematics learning achievement. The combination of the three predictors also had no significant impact on the mathematics learning achievement of the students. The implication of this finding is that having a positive attitude towards EET, familiarising oneself with it and even utilising the technology is not likely to lead to an improved leaning unless it is used with the intent to advance student learning achievement. The students appear not to have been utilising the EET for learning purposes. Teachers of mathematics should, therefore, aid learners using EET in their schools to utilise it for learning purposes and not for only just social interactions. This is because an increase in the utilisation of EET for reasons other than mathematics learning may result in a decrease in student learning achievement.

RECOMMENDATIONS

Based on the findings of the study the following recommendations were made:

1. Senior secondary students should try to familiarise themselves with EET because it has a positive contribution to mathematics learning achievement
2. The students should be guided to develop positive attitude towards EET.
3. Mathematics teachers should aid senior secondary students to utilise the EET for educational purposes and not for other purposes.
4. Stakeholders in education should try to make available relevant EET to the learners to enable them to familiarise themselves with it, develop a positive attitude towards the use of EET and utilise it for effective learning to impact on their learning achievement in mathematics.

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INCORPORATING SOCIAL MEDIA IN EDUCATIONAL PROCESSES AT INSTITUTIONS OF HIGHER LEARNING IN LESOTHO: STUDENT-TEACHER PERSPECTIVE

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Abstract

In recent years the use of social media at institutions of higher learning has widely been increased and engaged in and outside the classrooms. This paper intends to investigate how both learners and educators can find ways in which the use of these tools can be used in order to enhance the delivery of content in class, collaboration with students and other stakeholders like industry captains in order to improve learning in Lesotho. Facebook, Twitter, My space, You-Tube and many others are widely used by students at higher learning institutions for various purposes and may be an easy transition to apply them on learning related activities. With so many social media tools accessible, the challenge is to find which ones will best suit the needs of both learners and educators for improved standards and quality of learning in Lesotho. The intention is to find the best tools that will address the learning objectives and outcomes per program. The paper will therefore look at how policies can be amended to accommodate adoption of these media in the learning environment in Lesotho. The study will also look into researches that can be conducted in order to find out how these applications can potentially improve and bring about change in the educational landscape in the country. The paper will also investigate what processes should be put in place for educators who are interested in incorporating these media to support learning. Students are already using these applications for relationship building, social interactions and other educational related platforms and officially using them to support their learning may transform the culture of learning in general.

Keywords: Lesotho, internet applications, social media, WhatsApp, Facebook, Share-It

Introduction

Kaplan and Haenlein (2010) define social media as a group of internet-based applications that build on the ideological foundations of Web 2.0 and that allow the creation and exchange of user-generated content. Social media is currently redefining the ways in which businesses and organization are reaching their audiences and communicating with these individuals. In an age of smart phones and social media, colleges and universities are now tasked with the ability to be able to reach their in this new online environment in contrast to traditional ways of learning, (Hendricks, 2014). Nowadays anyone can log on to a social media site and share link, add comments and make other activities that the platform provides. Social media helps in making connections between students and teachers as well as other students and peers from

other institutions. Students can also share links, answer questions from the teacher and even post questions and comments to fellow students (Heiberger & Harper 2008).

The most common applications used locally are WhatsApp, Facebook, Share-It and Cloud Computing while a few use Twitter. Recently there has been a rapid development of information and communication applications and this has led to debates about incorporation of social media into current educational curriculum and processes. Social media expansion has been seen promoting personal relationships, exchange of ideas and information sharing, aspects that can contribute positively to education. These tools provide opportunities for individual expression as well as interactions with other users (Arnold & Paulus, 2010). Social media can include blogs, wikis, media (audio, photo, video, text), sharing tools, networking platforms (including Facebook), and virtual worlds. Across all spheres of learning students are adopting these tools to assist them in sharing information with their peers, looking for clarifications from educators and overall learning experience.

All tertiary students have become increasingly aware of downloading these applications in their smart phones or computers and this has shown that so much can be done to incorporate them within the education processes at this level. On daily basis students are using these gadgets to assist them download these tools to be able to have access to information for their studies. In light of this development, one cannot ignore but imagine if all these tools can officially be adopted by the institutions of higher learning in order to enhance learning and facilitate sharing of information between learners and educators. For easier interaction, some educators at tertiary level have also welcomed the idea of sharing information with students using these tools. Daily class exercises, assignments, projects, that are instructed to students to attempt are forwarded using either Facebook, Share It and Whatsapp Applications and these have simplified the hassle of having to print a lot of material to give to students. It has also improved on time management as students sometimes do not have to consult the educator in order to access materials and clarification where needed.

Students are warming up to these new developments regarding social media for easy access. It has become a tap on the button to ask for help from peers or to consult a lecturer. Student engagement represents both the time and energy students invest in interactions with others through educationally purposeful activities (Kuh, 2001). Nelson Laird and Kuh (2005) reported that students who use information technology for academics also have a higher likelihood of contributing and participating in active, academic collaboration with other students. This collaboration indicates that as engagement with technology increases, engagement with academics also increases, promoting a deeper connection between the students, educators, and course content (Mehdinezhad, 2011). By participating in a community of learners, students become more engaged with the course content which increases the achievement of popular learning outcomes, such as critical thinking and individual student development (Carini, Kuh, & Klein, 2006; Kuh, 1993, 2009; Kuh, Cruce, Shoup, Kinsie, & Gonyea, 2008; Pike, Kuh, & McCormick, 2011).

Current research has indicated that using social media as an educational tool can lead to increased student engagement (Annetta, Minogue, Holmes, & Cheng, 2009; Chen, Lambert, & Guidry, 2010; Junco et al., 2011; Patera, Draper, & Naef, 2008). By encouraging engagement with social media, students develop connections with peers, establish a virtual community of learners and ultimately increase their overall learning (Fewkes & McCabe, 2012; Heafner & Friedman, 2008; Jackson, 2011; Kuh, 1993; Liu, Liu, Chen, Lin & Chen, 2011; Nelson Laird & Kuh, 2005; Yu, Tian, Vogel, & Kwok, 2010).

Locally, Whatsapp and Facebook and recently Share It have been seen engaged by both students and some educators for collaboration, although the use has not been spread across the whole institutions it seems to be an ideal experience for both subjects. There are some students however who are still reluctant to use these tools to engage with educators mainly due a sense of respect tied to the fact that when students require any meeting with the educator, it should be via consultation in the office. Other educators also still do not warm up to the idea mainly because of their experiences with students asking untoward information through these tools.

Statement of the Problem

The emergence of social networks applications in recent years has seen many people using them to share information, mutual relationships, connecting with peers and interacting in various ways about issues that affect them. Many educators however have always been critical of these applications when it comes to their protection, unproductiveness and time wasting. Educators still consider these as social applications where young people connect for entertainment and socialization and thus many have not recognized them as tools that can be adopted to improve educational processes. Incorporation of these applications has also not been a subject of debate locally on how they can be implemented to enhance and boost students learning in or outside of the classroom. Although students have adopted these technologies to disseminate and share information, that is as far as it goes. Some lecturers have not come forward to also consider these applications to assist them into liaising with students to improve learning. The misuse and negative statements about the use of these technologies have also been rife resulting in most people viewing them in a bad light instead of viewing them as relevant applications that can contribute positively to teaching and learning.

Study Objectives

- To investigate the current use of social media applications by students and lecturers at higher institutions in Lesotho
- To establish the prospects of adopting social media applications into course curriculum
- To find out the impact of social media on educational processes at higher institutions in Lesotho

-To establish the benefits of social media at institutions of higher learning, with regard to leaning enhancement and the possible challenges associated with the adoption of social media applications.

Research Questions

Do lecturers and students use social media applications for teaching and learning?

Is there infrastructure in place for implementation of these Applications?

What are the views of lecturers and students towards adoption of these social networks Applications?

Conceptual Framework

In recent times the emergence of social media has had a huge impact in almost every area of our daily activities. The popular misconception that it can only be used for social interaction and forming relationship has completely changed. These networks have now evolved and expanding to areas of teaching and learning. This has been seen where information sharing, discussion on course content at institution of higher learning are using these networks as opposed to traditional way of learning in a classroom setting. This study adopted Bandura's social learning theory which is based on the idea that we learn from our interactions with others in a social context. Separately by observing the behavior of others, people assimilate and imitate that behavior, especially if their observational experiences are positive ones or include rewards related to the observed behavior. According to Bandura, imitation involves the actual reproduction of observed motor activities, Bandura (1977). Bandura believes that direct reinforcement could not account for all types of learning. For that reason, in his theory he added a social element, arguing that people can learn new information and behaviours by watching other people. From this perspective the study therefore seeks to find out whether incorporating social media networks on educational processes may assist in developing higher education curriculum and systems. Findings and recommendations for this study can be implemented to improve educational landscape at higher institution in Lesotho.

Methodology

The population for this study was lecturers and students at these two institutions. Twenty students and four lectures from each institution were chosen to participate on this study.

The sampling procedures used were convenience sampling and purposive sampling. The study was carried out during examinations at these two institutions and using available sample assisted in coming up with the information for this research as it would be difficult to target the specific population during the running of exams. The data was gathered using focus group discussions and face to face interviews which were carried out using unstructured questions/interview guide which allowed respondents to provide opinions and views in details without being restricted by close ended questions. Interviews and focus group discussions with the respondents were audio taped and transcribed and responses based on

the above research questions were recorded. A qualitative approach to this study gave in-depth data that answered the research questions.

Because the data was mainly qualitative, descriptive analysis was used to analyze information obtained from the interviews. The research questions guided this analysis.

Findings

For the purposes of this study the two institutions studied will be referred to as Institution **A** for Private Institution and Institution **B** for the Public Institution.

The Use of Social Media Applications by Students and Lecturers at higher institutions

At institution **A** there is a policy for usage of WIFI and this can only be used on campus, where students access it all the time during their stay on campus. WIFI connectivity is readily available to students through IT department and they can access it with computers and laptops at any given time. At this institution there are no residences for students, this means that outside of the school premises the students cannot have access to WIFI. However students have smart phones that assist them in accessing social media application through their various network subscriptions outside campus. On the population that was studied, four out of five students had smart phones with internet access while one used an ordinary cell phone that only allows for calls and Short Message System.

The discussions revealed that students have social media connections with some lecturers which they used mainly for educational purposes. Students showed that younger lecturers usually used social media applications to share information and materials with students (although it was not measured how young is younger). They said that they have groups in WhatsApp and Facebook together with their lecturers and other groups formed only for students in a certain course only. They indicated that they used Share-It application that allows them to get educational materials, assignments, notes and projects from their lecturers and these make easier access of the information for the whole class at the same time.

Students also revealed that other lecturers also allowed them to submit their assignments through Share-It, emails and cloud computing applications. However they stated that older and some lecturers did not allow them to use social media applications for educational purposes in anyway. They showed that these lecturers believed that these applications can only be used for social interaction with peers and family not to be adopted as tools for educational purposes. Students believed that older lecturers are misguided in terms of social media use as they tend to believe every aspect on the negativity of social media misuse by others. It is their belief that misuse of social media application by the youth has clouded their understanding of the importance and the positive impact social media can have in the educational landscape. They indicated that these lecturers prefer traditional methods of

printing a pile of notes to provide to students rather than adopting various social media applications to assist them in sharing information with students instantly and at the same time.

Lecturers also agreed that social media can either be used to enhance teaching and learning but felt that it has to be implemented as a policy to be adopted by all stakeholders. They argued that misuse of the social networks applications by the youth and other adults resulted in them not adopting them in their courses. While others viewed this issue negatively, majority of the lecturers indicated that they appreciated the use of social networks application for dissemination and sharing of educational materials between lecturers and students.

These lecturers highlighted their enthusiasm at the prospect of social networks applications officially being part of course curriculum. They showed that these applications make their job easier and allow students to easily interact with them and other students. They also maintained that consultation has also become more effortless as students do not have to wait for the next day to ask for clarifications. Lecturers however indicated stringiest measures to be put in place when it comes to securing these networks to avoid being misused by hackers and other students and members of staff who may maliciously target them. This will prove secure all stakeholders and ultimately avoid possible threats and abuse that may be imposed on others.

At Institution **B**, there is no WIFI provided for by the institution, students rely on their network subscription through their smart phones for internet access and use of social media applications. At this institution, three out of five students had smart phones. Students at this institution indicated that there has not been a proposal by their lecturers to employ social media applications in their curriculum and they believed if it was applied, it would make their learning better. They argued that it is a challenge for them when they encountered difficulties with their assignments and projects during weekends or outside of campus as they cannot readily connect with their lecturers to request assistance rather they have to wait for school days to be assisted. They indicated that only students studying Computer Systems Engineering have access to the internet and this is only during the period of study.

They showed that they have formed groups on WhatsApp and Facebook with their classmates to make it easier for them to exchange information and interact about various matters regarding their studies. Students at Institution **B** felt that adopting these social networks as part of curriculum would allow them easy access to educational materials and other information related to their studies, as lecturers would easily upload information on these networks for all students to access at the same time. They emphasized that these applications should be secured in order to avoid being misused by students and lecturers, in such a way that only education related information should be discussed on these platforms not any other business.

The study revealed that majority of students at these institutions are very familiar with Facebook, Twitter WhatsApp and Share-It applications and they use these networks mainly for socialising with friends, sharing academic information and materials with peers. Students indicated that they have formed various groups on Facebook and WhatsApp with peers and in other groups with lecturers and this is where they discuss various courses content. All lecturers used smart phones and used WhatsApp and occasionally Facebook and Twitter. They indicated that they use these applications for communication and socialization with peers rather than educational purposes.

The effectiveness of adopting social media applications into educational processes

Students were of the view that these social networks can be employed as extra tools in educational processes but not replace traditional way of instruction. Interviews revealed that although students believed that they are able to share academic information among themselves, they strong believed in the presence of a lecturer in the classroom. They maintained that they understand better when the lecturer is physically teaching in the classroom setting than using social media as a medium of instruction.

Students maintained that attending and taking notes in class provide them with the opportunity to personally interact with the lecturer and ask for clarification where it is needed, whereas it may take some time for a lecturer to respond or provide feedback to them when using social networks. They indicated that sometimes there may be technical challenges associated with networks and connectivity, unavailability of data, other students without smart phones to access information which may render it difficult to instruct with social media. For students, it is only desirable to use these networks as part of added tools for learning, thus the traditional way of having the teacher present in class remains the most effective for their learning.

Discussions also showed that some teachers do not use social media to share information to students, with a few exception that sometimes use social media to disseminate information to students. Although Institution A is a private institution and technology inclined and mostly characterized by young lecturers, some of them are not that much inclined to using these applications as medium of instruction. Students indicated that for some courses, lecturers agree to be consulted through social media whenever a need for clarification or consultation arises, however that is as far as it goes. For other courses however lecturers share course materials through social media with students. They indicated that they have formed Facebook and WhatsApp groups with such lecturers in related courses so that when the lecturer needs to instruct on a certain topic, clarify on given assignments or projects he can do so to the whole class at the same time in the group, instead of waiting to meet students in the classroom.

Students at Institution **B** argued that they are not allowed at all to interact with lecturers through social media network. They only formed groups in these platforms to allow easy learning and sharing of information among themselves. Lecturers do not allow them to interact under any circumstances with them and that the institution does not provide free internet access except for students enrolled in computer courses. They also were of the view that the absence of free WIFI access at the institution means that they have to subscribe for data which they have to buy from local network providers and this is expensive for them. While they argued that they also expect lecturers to be present in lecture halls, the adoption of social media applications can help advance their learning.

Results demonstrated that students perceive lecturers as negative towards the use of these networks as they tend to be misused by other students and thus they do not find it worthwhile to be used as tools for learning. They argued that this could be a result of misbehaviour of some of their peers towards lecturers or the misconception associated with social media platforms. Hamid (2009) also argues however that adopting these social technologies in class room needs careful plan for some reasons, for instance not all the people are eager to have these technologies due to various reasons such as diversity of experiences, familiarity, attitudes and expectation of the students towards online technologies.

The impact of social media on educational processes at higher institutions

On the other side lecturers, believe that students become more engaged during the use of social media networks. They revealed that even a quiet student in class would ask a question, suggestion or comment in Facebook and Whatsapp group engagement while it would be impossible for him/her to do that in class. They believed that this could be a result of students or young people relationships with these applications. While lecturers showed that it is easier to use these networks to help deliver course content to students, they could not advise that these technologies be included in the course curriculum rather for individual lecturers to use them when it is appropriate for them.

Lecturers argued that adopting these technologies as methods or tools of instruction reduced students' attention to actual course content. This was attributed to the time students spent on these networks. Other lecturers were of the view that they mostly use Whatsapp for daily messages with family members and friends, and that they would not want their phones or laptops to be bombarded with messages and information from students.

Results showed that lecturers rarely use WhatsApp to communicate messages to class representative on matters that relate to courses that they teach. Lecturers had negative views regarding the use of social networks as part of education curriculum indicating that students tend to use these applications unproductively. From their own point of view social media should only be used to socialize with peers not as part of learning. However the younger lecturers showed no negative opinion in this matter revealing that they are already using

social media to reach out to their students as it makes it easier for them to communicate or provide materials to the larger group at the same time.

Students at both institutions were of the view that institutions should put infrastructure in place to allow for smooth adoption of social media networks in the educational system at higher institution. Wandel (2008) agrees that educational institutions globally are already operating through social media thus contributing in development of student support service and having easier access to potential students. Social media has shown to be the most effective tool to engage students.

Discussion of Findings

Students are aware of the impact of social network applications on teaching and learning and how these can be implemented to assist students and lecturers. Students are already using these applications to share materials, interact with other students and receive or send educational related information. Students argued that social media networks make their work a lot easier and believed that if they could be adopted as part of academic curriculum, it would mean a great achievement on their part. Proponents of Web technologies in education have long argued that these technologies supplement and upgrade the widely accepted traditional delivery of lessons to students. For example, with reference to traditional learning, Vygotsky (1980) argued that human beings learn best if there are some sorts of interaction through collaborative learning and group work so that students work together on a task. In this social media era, the said interaction and collaboration in teaching and learning is now implemented virtually without worrying about time and space limitations or barriers. To this end, some educational researchers have coined the term Learning 2.0 in reference to “a spectrum of all pedagogical approaches that draw heavily upon Web 2.0 tools [Facebook, Twitter, blogs, WhatsApps, etc.] and services” (Wheeler, 2010).

Although some lecturers are still skeptical in endorsing these applications as tools that can enhance learning, it is important to note that some have already adopted the use of these tools to help them reach out to students. They are already receiving and sending student works through these applications and students concerns are clarified through them. Lecturers that are against the use of these tools, argued that they distract students from concentrating in class because they may sway their attention to other unimportant things. Literature also shows that opponents of social media use in a classroom continue to downplay the value of such technologies. Among others for example, Barczyk and Duncan (2011) observe that critics of social media in academia often point out that social networking sites offer poor reference material often generated by unreliable sources. Some instructors in higher learning institutions have consequently been reluctant to adopt social media in their teaching and learning activities. Some instructors perceive social media such as Twitter and Facebook as distracters to learning (Galagan, 2010).

Findings also highlighted different dynamics from these two institutions. It was revealed that the Private Institution has no infrastructure in place to allow student easy access of social networking sites or internet in general and that lecturers in this institution do not allow for any interaction and collaboration using these applications. While students in these institutions pay for these applications through their own networking subscriptions, they felt the need for their institution to install WIFI at their institution in order to enhance their learning. They argued that they are already conversant with the use of these applications because already they are in various WhatsApp and Facebook groups with their peers and also use Share-It App to share educational materials. At the Private Institution students have access to WIFI and can use it at anytime during their stay on campus to download materials and share information with their peers and some lecturers who allow them to interact through these sites.

The results also indicated that students would like to see the use of social media networks adopted as part of learning but not entirely replace the traditional methods of learning. Finding revealed that students still views the presence of a teacher in the classroom as the most important and that these Applications should be added as tools to improve on already existing method not replace it. The importance of implementation of these technologies cannot be overemphasized but the results are indicative of the fact that traditional methods are still viewed as most effective and these networks should be adopted to improve on exiting

Conclusion

Results showed that incorporating social networks applications to the educational curriculum may enhance learning and provide students and lecturers with convenience to share and disseminate information. This will also afford students the opportunity to sharpen their skills in terms of communication and interaction with course related content with their lecturers and peers. It is also important to note that students are more comfortable in using social media to express themselves, this helps in exchanging views and discussing content with other students in or outside of their classroom thus also contributing to their ability to connect and collaborate with others. Students who are not able to orally participate in class seem to be comfortable sharing information with others through social media, so incorporating these networks seem applicable to assisting these types of students to express themselves. These networks are seen as efficient in communicating tasks and announcements by other lecturers to students quickly without a lecturer having to be there in person. Higher learning institutions provision for access to these networks is a stepping stone to improved learning capabilities that can see students and lecturers sharing of teaching resources effectively and allowing for quicker information dissemination and facilitation of effective communication. It is also worth noting that not all lecturers agree to the adoption of these networks into the course curriculum, as a result of misconception surrounding them. There are securities concerns surrounding the use of these networks as part of teaching and learning which needs to be looked into before they are approve as working tools at institutions of higher learning.

Recommendations

Consultations should be made with relevant stakeholders to allow different views and opinions regarding incorporation of these networks before they can be implemented

Proper infrastructure has to be put in place for students to be able to have access to social networks on campus, this can be achieved

Higher learning institutions should allow for enabling environment for students and lecturers to put in place social networks as tools for educational processes, this will allow for rapid access of educational materials and consultations for students

Training on the use of these applications is paramount to lecturers and students for smooth progress

A paradigm shift is needed from the lecturers to not only see the negative side of social networks but as tools that can contribute positively to students learning, this can be ensured through proper training of lecturers as educators and students on the use and adoption of social media on educational curriculum.

It is also important that these networks are secured for intended educational processes to disable attempts to be misused to also avoid exposing institutional content at risk. This will also pave way to avoid putting users at risk of unbecoming behaviour by others.

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EFFECTS OF COMPUTER-AIDED AND BLENDED TEACHING STRATEGIES ON STUDENTS' CIVIC ATTITUDES IN RURAL LEARNING ECOLOGIES

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Abstract

Researchers have stressed the importance of Civic education in finding solutions to civic problems. As integral as Civic education is, Nigerian citizens are rich in knowledge of citizenship ideals but deficient in values, attitudes and behaviours that characterized civic literate citizens. Consequent on this deficiency, Civic educators and researchers have focused attention on how to address the problem through the use of 21st century learning technologies, which are yet to be adopted in secondary schools in Nigeria. Teachers' strategies of teaching particularly those relating to the conventional methods have been found to be inadequate for a value-laden subject like Civic education. The computer-aided teaching strategies that would develop civic values, attitudes, and skills to enable students take responsibility for their learning experiences have been promoted. This study, therefore, determined the effects of computer-aided and blended teaching strategies on secondary school students' civic attitudes. The study adopted the pretest-posttest, control group, quasi-experimental design using 3 x 2 x 3 factorial matrix. Seventy-eight students from six intact classes in secondary schools in Ondo State were selected for the study and randomly assigned to experimental and control groups. Five instruments used were: Students' Civic Attitudes Scale ($r=0.88$), Academic Ability Test ($r=0.72$), Computer-aided and Blended Teaching Instructional Guides for experimental groups and Teachers Instructional Guide for Conventional Lecture Method for the control group. **Three research questions were answered.** Data was subjected to Analysis of Covariance, Estimated Marginal Means, and Scheffe's Pairwise Comparison. There was a significant effect of treatment on students' civic attitudes ($F_{(2; 61)} = 3.82, p < 0.05; \eta^2 = .10$). The students' exposed to Computer-aided teaching strategy had higher adjusted attitude mean score ($\bar{x} = 106.02$), than the control group (105.61), and the blended teaching strategy group ($\bar{x} = 75.73$). It was, therefore, recommended that teachers in public secondary schools in developing countries should explore the benefits of enhancing students' civic attitudes with Information and Communication Technology based strategies in civic education classrooms.

Keywords: Computer-aided teaching strategy, Blended teaching strategy, Students', Civic attitudes, Rural learning ecologies.

Introduction

The vital role played by Civic Education in the development of desirable attitudes in youths needed for effective participation in the information age **is** practically missing in educational

disquisition. The integral goal of educational institutions in 21st century is the groundbreaking responsibility of training young citizens for democratic ‘coming times’. It is premised on the functions of school in preparing young citizens for participation in democratic societies **who** Cohen and Chaffee (2012) described the as ‘**engaged citizens’ in innumerable societal spheres which ranges from blogging and spurning to involvement in municipal movements and assembling other civic actors to register a vote, and contest for elective offices.** The declaration of these scholars painted the expected behavioural outcomes of a young person produced by the ‘school’ of the information age. I passionately describe the qualities described by Cohen and Chaffee (2012) as ‘civic attitudes’. In this study, I deployed the Computer assisted teaching approaches to develop students’ civic **attitudes** in six rural learning ecologies. The teaching strategies were mounted on the machine that triggered the third revolution in education (see Ige, 2012) to enable students in rural learning ecologies develop and exhibit civic attitudes similar to their colleagues in urban learning ecologies when they interact in virtual learning communities on sensitive public debates.

Computer-aided Teaching Programme and Students’ Learning Outcomes

Computer offers innumerable opportunities that are beneficial to learning across trans-disciplinary boundaries. There is virtually no discipline in any educational institutions across the globe that has not integrated Computers, and other related devices in her teaching-learning process. Scholars declared that with speedy expansion of Computer technology and its associated influence on nations of the world, schools must evolve teaching strategies that will enable students to meet the socio cultural dynamics of the 21st century (Shoemaker, 2013; Maninger & Holden, 2009; Uibu & Kikas, 2008). Shoemaker (2013) utilized the experimental paradigm of non-equivalent control group type to evaluate the impact of Computer-aided instruction on fifth grade mathematics learners and achievement, and discovered that Computer-aided instruction **has** no significant effect on the selected **students’** academic achievement. However, the treatment significantly influenced the attitudes of under-achieving students in fifth grade mathematics. Kposowa and Valdez (2013) in their study discovered that students that used laptops performed better in English Language and Mathematics than students without laptops. These scholars consequently advocated that teachers should make profound usage of technological devices in their teaching-learning activities. It should be noted that the contents of the computer-aided strategy utilized in this study were put on laptop computers for students in rural learning ecologies that participated in the study.

Blended Teaching Strategy and Students Learning Outcomes

Blended teaching strategy emanated on the need for teachers to develop 21st century compliant teaching strategies to maximize learners achievement in schools. Movahedzadeh (2011) corroborated this statement that the prominent role played by technology in the transformation of the learning space led teachers to **re-plan** their traditional courses using a hybrid model, otherwise known as ‘blended learning’. Many nations of the world **opened**

their stance on twenty-first century education consequent on the inescapable use of the Internet (Bell, 2016). Blended learning means different things to different teachers and it varies across schools in the world depending on the objectives of the lessons being taught. In this study, blended teaching strategy connotes an admixture of Computer-based learning and conventional lecture method due to limited availability and expensive nature of Internet access in rural learning ecologies.

Rural Learning Ecologies

Rural learning ecologies connote schools and their communities in rural geographic locations (Hlalele, 2015; Cloud, 2005). Jackson (2016) described a learning ecology as a 'person in environment' and 'person in activity' concept. These imply the personality of the learners and other supporting factors in the ecosystem of their rural geographical locations, as well as peculiar activities that defines the learners in a rural context. The concept of rural learning ecologies not only included schools, but other factors in the social ecology of the learners. Hlalele (2013) affirmed that a learning ecology cultivates and reinforces the formation of communities which are constantly evolving, majorly self-organizing and sharing with each other. The schools utilized for this study have these features, and are the major schools servicing the educational needs of the rural communities in which they are located. From the observation of the researcher, and his assistants, the study was conducted in the selected schools at a time the civic participation of the students needed to be impregnated. The utilization of the selected schools is premised on Collin (1997) phenomenon of 'geographic isolation' which has caused the paucity of teaching staff, which has grave consequences for the reconfiguration of civic dispositions of learners in these schools.

The present study carried out a systematic inquiry to examine the effects of Computer-aided teaching strategies on students' civic attitudes in rural learning ecologies. It also determined the moderating effects of gender and academic ability on the civic attitudes of the selected students, and sought answers to the following questions:

1. What are the effects of Computer-aided and blended teaching strategies on students' civic attitudes?
2. Which of the teaching strategies **has** the most effect on students' civic attitudes?
3. Will there be any reciprocal effects of Computer-aided teaching strategy, blended teaching strategy, gender, and academic ability on students' civic attitudes?

Methodology

Research Design

The pretest-posttest control group quasi-experimental design was adopted for the study. A 3x2x3 factorial matrix which consisted of instructional strategy at three levels of treatment (two experimental groups and one control group), intervening variables of cognitive ability at three levels (low, average, and high) and gender at two levels (male and female) was utilized. The data collected was subjected to Analysis of Covariance (ANCOVA) using the pretest scores used as covariates. The

Estimated Marginal Mean aspect ANCOVA was used to determine the magnitude of performance across the groups.

Selection of Subjects

The participants of the study comprised 78 Junior Secondary School students. Six Intact junior secondary school II classes were selected in each of the six secondary schools. The Junior Secondary School II Students were for the study because, civic education is taught at Junior Secondary School level in Nigerian secondary schools. The students were selected because they were ready and available to participate in the study.

Ethical Consideration

The researchers took permission from the management of the schools selected for the study. The researcher sought the informed consent of the students consequent on permission of the selected School's Management Team. Information about the study was given to the students before the commencement of the study to avoid frustration of both the participants and the researchers. The students were assured they could disengage at any time without fear of victimization.

Civic Education Concepts selected for the Study

Five concepts that were found to be central to the development of effective citizenship (Ige 2013; Amosun, Ige and Choo 2015), namely citizenship, social issues and problems, negative behaviours, values and communication, were selected. Research has shown that these concepts are central to the development of effective citizenship (Ige, 2013; Ige, 2012; Amosun, Ige and Choo, 2015; Ige & Hlalele, 2017).

Research Instruments

Computer-Aided Teaching Programme in Civic Education (CATPCE)

The CATGCE was designed by the researcher to guide teachers in experimental group 1. This was done to ensure conformity to the research process. The CATGCE was put together on each on each selected topic: values, citizenship, ICT, problems of ICT, negative behaviours and social issues and problems for the study. The instrument was validated by experts in the field of social studies from the Department of Social Science Education, Adekunle Ajasin University. The lecturers review was built into CATGCE to enhance content appropriateness for the target students, and curriculum objectives.

Blended Teaching Programme in Civic Education (BTPCE)

The BTGCE was put together by the researcher to guide the teachers in experimental group 2. This was done to ensure non-distortion of the research procedure. The BTGCE, a combination of face to face and computer-assisted teaching modes was prepared on the six selected concepts for the study. Three of the concepts namely, citizenship, problems of ICT and values were animated and put into slides on Microsoft Powerpoint, while the remaining concepts namely ICT, social issues and problems were taught face to face. The instruments were given to lecturers in the social studies unit of the Department of Social Sciences Education, Adekunle Ajasin University to determine the internal

consistency, relevance, and appropriateness of the instrument. The comments of the lecturers were used to amend the instruments.

Teachers' Instructional Guide on Conventional (Class) Lecture Method

The TIGCLM was designed by the researcher to guide teachers in the control group. This was to ensure uniformity. The TIGCLM was prepared on each of the concepts selected for the study. The Conventional (Class) Teaching Method Guide is made up of five steps; these are:

- The teacher introduces the concept
- The teacher discusses facts or ideas on the concepts in steps
- The teacher gives notes on the concept
- The teacher asks questions
- The teacher gives assignment to students

Cognitive Ability Test

The Academic Ability Test (AAT), a modified form of the Sigels cognitive style test was taken from Ige (2001) and used to measure the students' academic ability. It consisted of twenty cards of pictorial representations. The first picture on each card is coded 'A', the second 'B', and the third 'C' for easy identification. The students are expected to identify the two of the three pictures that have common characteristics, choose any two pictures from the three in each group that they feel are complementary, and give reasons for such a choice. The test was first administered on sixty students, and re-administered after a two week interval on the same group of students. The correlation coefficient of the two sets of responses was computed using Pearson Product Moment Correlation, the stability coefficients of $r= 0.60$ to 0.72 was obtained.

Students' Civic Attitudes Questionnaire

The civic action, interpersonal and problem-solving skills, and political awareness sub-scales of Civic Attitudes and Skills Questionnaire developed by Moely, Mercer, Ilustre, Miron, and McFarland (2002) was used to elicit **responses** on the civic skills of the respondents in rural learning ecologies. The Civic Skills Questionnaire consisted of two sections. Section I gathered information on the demographic information of the students. Section II of the instruments has three sub-scales namely civic action, interpersonal and problem-solving skills, and political awareness. The civic action attitudes sub scale has statements like: 'I plan to be involved in my country', 'I plan to participate in a community action programme', 'I plan to be involved in programmes to help clean the environment' and 'I plan to help others who are in difficulties'. In this study, an estimated α co-efficient value of 0.81 was got using

split-half method. Examples of statements in the interpersonal and problem-solving attitudes sub scale are: 'I can listen to other people's opinions', 'I can successfully resolve conflict with others', 'I can think logically in solving problems' and 'When trying to understand the position of others, I try to place myself in their positions'. The estimated reliability coefficient of the sub scale using cronbach alpha is 0.74. The political awareness attitudes sub scale contain statements like: 'I am aware of current events', 'I understand the issues facing this nation', 'I am knowledgeable of the issues facing the world' and 'I plan to be involved in the political process'. In this research, the calculated α co-efficient value was 0.88 employing cronbach alpha for this sub scale. The items in the research instrument were structured on a six-point Likert format varying from strongly disagree (1) to strongly agree (6). The total Cronbach's co-efficients of the three sub scales was 0.86, this was done by adding the responses of the students in each of the three sub scales in Section B. The scores on the first two sub scales were then regressed in contrary to the third sub scale (Aremu, 2005).

Experimental Group One: Computer-Aided Teaching Strategy

The steps are as follows:

Step 1: The teacher distributes the students into mixed gender groups according to their academic abilities i.e representation of students with low, moderate and high abilities

Step 2: Each group is allocated a laptop with the topic contents of topic to learn on the screen, and as well a group leader.

Step 3: The teacher introduces the topic

Step 4: The teacher presents the contents of the lesson to the students, while the group leader moves the animated Microsoft Powerpoint slides

Step 5: The teacher allows a student in each of the mixed gender groups to ask questions on the lesson presented.

Step 6: The teacher answers the students' questions.

Step 7: The teacher asks each of the mixed gender groups to do the group discussion.

Step 8: After group discussion, the group leader presents the group's answers.

Step 9: The teacher notes the main points in each of the group leader's presentation and summarize the lesson.

Step 10: The teacher asks each mixed gender group leader to close the animated Microsoft PowerPoint slides and shut down the laptop computers.

Experimental Group Two: Blended Teaching Strategy

The Blended Teaching Strategy Guide is the combination of Computer-aided Teaching and Conventional Lecture Method used alternately on weekly basis; these are:

- The teacher introduces the concept
- The teacher discusses facts or ideas on the concepts in steps
- The teacher gives notes on the concept
- The teacher asks questions
- The teacher gives assignment to students
and

Step 1: The teacher distributes the students into mixed gender groups according to their academic abilities i.e representation of students with low, moderate and high abilities

Step 2: Each group is allocated a laptop with the topic contents of topic to learn on the screen, and as well a group leader.

Step 3: The teacher introduces the topic

Step 4: The teacher presents the contents of the lesson to the students, while the group leader moves the animated Microsoft Powerpoint slides

Step 5: The teacher allows a student in each of the mixed gender groups to ask questions on the lesson presented.

Step 6: The teacher answers the students' questions.

Step 7: The teacher asks each of the mixed gender groups to do the group discussion.

Step 8: After group discussion, the group leader presents the group's answers.

Step 9: The teacher notes the main points in each of the group leader's presentation and summarize the lesson.

Step 10: The teacher asks each mixed gender group leader to close the animated Microsoft PowerPoint slides and shut down the laptop computers.

Control Group: **Teachers' Instructional Guide on Conventional Lecture Method**

The TIGCLM was designed by the researcher to guide teachers in the control group. This was to ensure uniformity. The TIGCLM was prepared on each of the concepts selected for the study. The Conventional (Class) Teaching Method Guide is made up of five steps listed under blended teaching strategy.

The treatment lasted for ten weeks in the selected schools. The Posttest was subsequently administered on the experimental and control groups.

Results

Table I shows that the main effect of treatment (Computer-aided and Blended teaching strategies) on students' civic attitudes is significant ($F_{\{2, 61\}} = 3.82$; $p > 0.05$; $\eta^2 = .11$). Partial

eta square (η_p^2) indicate the effect size, it is small at 0.1, medium .06 and large at .14 (Piworwar, Thiel, & Ophardt, 2013). The magnitude of performance across the groups of treatment is presented on table II. This variation indicates that there is a significant difference in the civic attitudes of students exposed to Computer-aided teaching strategy, conventional lecture method, and blended teaching strategy.

Table II shows that with a grand mean of 98.31, students exposed to Computer-aided teaching strategy (Exp. Group I) had the highest attitudinal mean score (106.02) followed by students exposed to conventional lecture method (105.61) and students exposed to Blended Teaching Strategy (75.73). The result showed that Computer-aided teaching strategy had the highest effect on the respondents' civic attitudes. This is consequent on the fact the independent variables, cognitive ability, and gender accounted for 59.1% ($.591$)² of the total variation in the civic attitudes of the students.

Table I: Analysis of Covariance on Students' Civic Skills

Dependent Variable: Post_Civic_Attitudes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	47895.682 ^a	16	2993.480	5.498	.000	.591
Intercept	13882.542	1	13882.542	25.500	.000	.295
Pre_Civic_Attitudes	9834.772	1	9834.772	18.065	.000	.228
Treatment	4162.459	2	2081.230	3.823	.027	.111
Gender	325.116	1	325.116	.597	.443	.010
Academic_Ability	2904.619	2	1452.309	2.668	.078	.080
Treatment * Gender	267.915	2	133.958	.246	.783	.008
Treatment * Academic_Ability	3542.552	3	1180.851	2.169	.101	.096
Gender * Academic_Ability	1732.259	2	866.129	1.591	.212	.050
Treatment * Gender * Academic_Ability	2105.536	3	701.845	1.289	.286	.060
Error	33209.498	61	544.418			
Total	899568.000	78				
Corrected Total	81105.179	77				

a. R Squared = .591 (Adjusted R Squared = .483)

Table II: Estimated Marginal Means on Students' Civic Attitudes

Variable	N	Mean	Std.Error
INTERCEPT			
Pre-Civic Attitudes Score	78	88.71	-
Post Civic Attitude Score	78	98.31	3.307
TREATMENT			
Experimental I (Computer-assisted Teaching Strategy)	26	106.019	7.373
Experimental II (Blended Teaching Strategy)	14	75.733	7.297
Control Group (Conventional Lecture Method)	38	105.612	4.427

The implication of the results on table II is that there is a significant difference in the students' civic in the treatment groups (Computer-aided and Blended teaching strategies) and participants in the control group (Conventional Lecture Method). This implies that significant differences existed in the civic attitudes of Computer-aided teaching strategy ($X= 106.02$), Conventional lecture method ($X= 105.61$), and Blended teaching strategy ($X= 75.73$). To ascertain the sources of the significant difference, Scheffe's post-hoc pair-wise comparison was conducted and presented on table III.

Table III: Scheffe's Pair-wise Comparisons of Civic Attitudes across the Treatment Groups

Treatment	Mean	Exp. I	Exp. II	Control
Exp. I	106.019		*	
Exp. II	75.733	*		*
Control	105.612		*	

* Implies that there is a significant difference

The result on table III reveals that the source of the reported significant differences emanated from the civic attitudes mean scores of students in experimental groups I and II, and civic attitudes mean scores of students in experimental group II and the control. The two-way interaction on Table 1 shows that showed no significant effect on students' civic skills ($F_{\{3, 61\}} = 1.29$; $p < 0.05$; $\eta^2 = .06$). This implied that civic attitudes of the students civic did not vary significantly among students with low, moderate, and high ability levels. Therefore, the attitude of the students was not sensitive as a result of exposure to different strategies of teaching.

Discussion

This enquiry is part of global efforts engineered at training young citizens in rural learning ecologies for functional participation in the information society. With the deployment of Computer-related devices to enhance the civic participation of learners in urban learning ecologies, it becomes extremely urgent to design teaching and learning platforms that ensures learners in the rural geographic terrains are not 'left behind'. Thus, the cynosure of this study is to explore the efficacies of Computer-aided and blended teaching strategies on students' civic attitudes in rural schools. The current study has revealed that Computer-aided teaching strategy positively influenced students' civic attitudes in rural learning ecologies. This

finding corroborated the position of Hew and Cheung (2014) on using blended learning to promote attitudinal change towards student's immediate nations. The revelation from the analysis of data gathered in this study further attested to the ubiquity of the Computer in modern day teaching-learning process. This finding is congruous with some prior studies (Kposowa & Valdez, 2013; Ige, 2012; Bottge, Ma, Gassaway, Toland, Butler, & Cho, 2014).

One of the rare findings of this study is the efficacy of the conventional lecture method over the blended teaching strategy. It should be noted that the dawn of the information age spurred educational researchers to develop and experimented with new strategies of teaching. Babayemi, Ahmed, Yisau, and Babalola (2016) stated that the outcomes of several teaching experiments negated the use of conventional lecture method consequent on its 'teacher addicted' nature. The opinions of these scholars might not be unconnected with the non-participatory nature of conventional lecture method. It is evident from the current study that conventional lecture method can be used to foster students' civic attitudes in rural learning ecologies where Computer-aided teaching devices are inaccessible. This negates the outcomes of previous studies (Ma & Lee, 2007; Lombardy, 2007) on the potency of blended teaching strategies in enhancing students learning outcomes, and Ige and Hlalele (2017) that discovered that Computer-aided and blended teaching strategy considerably enhanced students' academic attainment than the conventional lecture method. The results of this study have shown that this might be an exception in teaching experiments aimed at fostering the civic attitudes of students in rural learning ecologies.

Implication for Teacher Education in Rural Schools

This study has implications for the teaching-learning process in rural schools. This study has shown that the future of rural learning ecologies depends on the use of Information and Communication Technologies to promote civic competence among students. It is recommended that teachers in rural learning ecologies should integrate computers and by extension the Internet (a new agent of socialization) as support tools in teaching. Stakeholders in education as well as educational researchers should unyoke rural schools from the 'civic shocks' of globalization caught by students in virtual learning ecologies, which are beyond the control of the students. As beneficial and demanding as these recommendations are, the research was carried out in Nigeria, therefore, caution should be exercised in generalizing to other developing countries. Notwithstanding these restraints, this study is philosophically relevant to the field of Teacher Education in rural learning ecologies.

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DIGITAL MEDIA USE AT A PRIVATE UNIVERSITY OF CREATIVE TECHNOLOGY LESOTHO: A PEDAGOGICAL APPROACH

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Abstract

Educational Technology in the 21st Century is perceived to be a lifelong responsibility characterized by many as “a technology that is here to stay, whether institutions of higher learning attempt to ignore it or not”. It is a fact that through media technology students are able to learn almost anywhere anytime. It is evident that students be it from learners from junior schools to higher education institutions (HEIs) perform very well with anything that has to do with digital media whether it involves playing mobile games, e-books and journals, online magazines and newspapers, making music, creating their own videos or social networking. The time has come for a paradigm shift on how institutions think about information dissemination, information seeking, learning and the role of peer and student assessment. The fact remains that things are now done differently to accommodate the new educational technologies of teaching and learning. This should be considered as a new theory of learning to bridge the knowledge gap. This research investigates the acceptance and use of digital media (mobile devices, e-learning, e-books, e-magazines and online newspapers) among final-year students at Limkokwing University of Creative Technology Lesotho (LUCT). In order to ascertain students’ use of digital media in Higher Education (HE) the current study aims to investigate LUCT final-year Communication students’ attitudes on selected aspect of Digital Media Technology usages. This is an explanatory mixed methods case study using both qualitative and quantitative methods to collect (i.e. purposive, convenient sample) and analyse data in a single study. The study starts with a data collected from a questionnaire, with open and closed questions, from **36** Associate Degree in Journalism- (**ADJM: Y3S1**), and **19** Associate Degree in Broadcasting (Radio & Television)- (**ADBRTV: Y3S1**) students in Faculty of Communication Media and Broadcasting (FCMB). Additionally, pedagogy of teaching and learning using digital media technology that would inform and guide students towards methodologies that promote autonomous interaction and collaborative work was examined. The findings of the study would show that LUCT should implement digital media technologies that enable students to become digital content-creators that enhance conception of knowledge within areas of personal learning using Digital Media Technologies in the classroom.

Keywords: *Digital Media Technology, Pedagogy, Digital Media Use, Teaching and learning*

1.1 INTRODUCTION AND BACKGROUND TO STUDY

The landscape of Higher Education (HE) is experiencing change as a result of technological innovations. Higher Education Institutions (HEIs) therefore are witnessing changes in the

way teaching is imparted and in the way students learn. New technologies and pedagogies continue to form the basis of higher education systems that will be complimented by various online learning opportunities and a greater variety of providers in HE. These new Digital Media Technologies (DMT) and approaches to teaching and learning are already having a clear and positive impact on HE provision. DMTs within various institutions of higher learning are also beginning to facilitate better education quality as educational resources globally become more freely accessible and interactive. This clearly indicates that teaching with DMT can now be designed to meet different individual needs in terms of progressing student feedback and performance.

The development of e-learning in HE is a relatively new aspect of academic and educational system in the curriculum implementation whose main purpose is to ensure sustainable practice of higher education and learning. The practice of e-learning in this regard is achieved through applications of DMT and social computing that promote and enhance effective pedagogy and teaching methods. The curriculum content for teaching and learning practices in HE are therefore presented through digital technologies.

According to Grosch (2013) the diffusion of DMTs into HE leads to persistent alterations within university learning environment that can highly influence student learning behaviour. Hence why universities are at liberty to comprehensively understand and analyse media usage reforms of their learners. Grosch (2013) further states that DMT usage for teaching and learning does not only include e-learning but also the use of text-based and other media such as print as well as other electronics. Electrical tools including; systems, devices and resources that process data are all considered as digital technologies including social media, online games applications and multimedia.

Furthermore, DMT plays a key role in internationalizing of education by giving learners the opportunity to reach out to other learners across the globe (global classroom). Moreover, digital media allows mobility for students by assisting to collaborate with others across the globe through social networks. Understanding digital media usage patterns allows institutions of higher learning to create conducive user-friendly environments that really fits the individual needs of the students.

E-learning practice as another form of DMT includes a wide range of ICT applications and strategies for exchanging information and gaining knowledge such as video conferencing, mobile computer devices, internet and web and electronic resources (Zaman, Shamim & lement 2011). For effective and sustainable development of e-learning in higher education, the lecturers must be knowledgeable competent in the use of technology and pedagogical aspects, although studies indicate general lack of skills among the professionals (Kandiri, 2012). E-learning is one of the most efficient pedagogical areas of teaching in education where the online curriculum is delivered in digital pedagogical method different from the

traditional approach, but whose major factor of success depends upon the lecturer's technical competency.

1.2 LITERATURE REVIEW

Under constant demands to improve the quality of higher education within an increasingly digital world, technology is often seen as a way to increase learning and collaboration on college campuses. The current generation of college students has grown up with technology, and these students are among the earliest adopters of new advances in technology (Jones, 2002; McHaney, 2011). Allowing students to connect to their campus community, collaborate with peers, acquire new information, and demonstrate their learning through technology is essential for college campuses seeking to meet the needs of today's college students.

Through evaluation of student perceptions of technology use, Nelson-Laird & Kuh (2005) report "there appears to be a strong positive relationship between using technology for educational purposes and involvement in effective educational practices such as active and collaborative learning and student-faculty interaction.

Living in a digital age, work, education, entertainment, and social connectivity are all experienced on the web. Becoming a commonplace activity, in 2012, ninety-six percent of 18-29 year olds used the internet (Pew Research Center, 2012). Individuals with higher levels of education used the internet more frequently; only 61% of individuals without a high-school diploma used the internet while 94% of individuals with some college and 97% with a college degree or higher were internet users (Pew Research Center, 2012).

Liu (2010) investigated students' use of different social media tools and their attitudes and perceptions towards these tools. The study revealed the top four reasons why students use social media tools. As reported, 85% use such tools for social engagement, 56% use them for direct communications, 48% use them for speed of feedback/results, and 47% use them for relationship building; however, fewer than 10% of the students mentioned using social media tools for academic practice. In a similar study, Browning, Gerlich, & Westermann (2011) surveyed 141 undergraduate students regarding their perceptions and beliefs about social media. A paper-and pencil survey revealed strong favourable perceptions of social media in general and a high degree of readiness to embrace social media portals as a way to deliver course content (Guy, 2012).

1.3 CONCEPTUAL FRAMEWORK

The study is guided by constructivism paradigm. The paradigm has been a key strand of educational discourse for more than twenty years (Conole & Alevizou, 2010). Technologies have been seen as a means of enabling new approaches to constructivism, both in terms of enabling the learner to take control of their learning and in terms of enhancing the social

dimensions of learning. It draws on both cognitive and behaviour influences and benefits from technology. It proposes that much of the research into pedagogy for using technology for learning advocates a move toward constructivist approaches. It put forward eight principles as providing the essence of constructivist pedagogy, emphasizing the student's role in knowledge acquisition through experience, puzzlement, reflection, and construction.

Therefore, pedagogy is based on the dynamic interplay of mind and culture, knowledge and meaning, and reality and experience. Learning should take place in authentic and real-world environments. Learning should involve social negotiation and mediation. Content and skills should be made relevant to the learner. Content and skills should be understood within the framework of the learner's prior knowledge. Students should be assessed formatively, serving to inform future learning experiences. Students should be encouraged to become self-regulatory, self-mediated, and self-aware. Teachers serve primarily as guides and facilitators of learning, not instructors. Teachers should provide for and encourage multiple perspectives and representations of content.

1.3.1 DMT as a catalyst for effective pedagogy

Fishman and Dede (n.d) confirm that DMT as a catalyst for teaching and learning is only effective when used to enable learning with richer content, more powerful pedagogy, more valid assessment and links between in and out –of-classroom learning. They support the idea that DMT can be used as an effective tool for collaboration and to broaden access to education, online and hybrid educational environments are also used for their ability to shift the way lecturers conceive of teaching and learning (Fishman and Dede, n.d) E-learning is also considered as one of the most efficient pedagogical reforms of teaching in education where the online curriculum is delivered in digital pedagogical method different from the traditional approach (Makori & Mautu, 2016). The two authors further stipulate that the reforms of E-learning through DMT in classrooms include but are not limited to game-based learning, flipped classroom and adaptive learning that are able to incorporate the traditional classroom to digital technological learning (Makori & Mautu, 2016).

1.3.2 Game-Based Learning

Game-based learning offers the possibility of moving beyond traditional forms of standards based assessment, to consider alternative dimensions of performance and achievement. (Schwartz and Arena, 2013).

In terms of the social dynamics of game-based learning, a common theme is that through video games young people cultivate interests and join 'affinity groups' that operate across contexts, as part of their projects of personal development. In these groups, players engage in sophisticated forms of learning fueled by the shared passion for gaming. They include forums where players share 'cheats' wikis that clarify elements of the game universe; and 'modding' groups who use game development skills to modify how games are played and experienced

(Gee, 2008). A similar, and equally popular, theme is that video games provide virtual worlds which are effective contexts for learning, because acting in such worlds allows learners to develop social practices and take on the identities of actual professional communities. These soft learning outcomes are seen by many commentators as more useful and worthy than the ‘outdated’ forms of knowledge acquired through traditional schooling (Shaffer, 2008).

According to Yang (2012) the concept of learning-by-doing comprises core constructivist principles that underlie game-based learning. As a model of learning in HE, gamified (game-based) learning involves a much more significant interaction from learners than more passive activities that were previously engaged by traditional face-to-face learning (Lenhart, Kahne, Middaugh, Evans & Vitak, 2008). It also provides effective and motivating learning environments. Therefore, Game-based learning can enhance learning motivation (Huang, 2011) and improve the learning effectiveness of students (2010; Liu & Chu, 2010; Yang, 2012). People acquire new knowledge and complex skills from game play (Federation of American Scientists, 2006 in Woo 2013).

1.3.3 Flipped Classrooms

The model of the “flipped” classroom is a pedagogical approach where a lecture and homework of a course are reversed and in-classroom experiences are reconstructed (Tucker, 2012). This typically is making them rely less on passive learning (Teacher centred) and more on active engagement (student centred). The idea behind the flipped classroom as a pedagogical approach has to do with accessibility and convenience as it allows studying anywhere at any time (Stone, 2012). The lecture in the flipped classroom can re-allocate the classroom time for other activities such as experiential or collaborative learning opportunities as opposed to being in front of the class lecturing students.

1.4 PROBLEM STATEMENT

While most Universities globally are actively involved in social media initiatives they are faced with the transformation in teaching and learning that incorporates DMT with the traditional teaching. The problem is that universities are not yet ready for this change (Vassiliou 2014), and Institutions have been slow in taking the lead of transforming teaching and learning that would allow flexibility in the facilitation of teaching and learning using digital media or technologies in classrooms. Furthermore, Vassiliou (2014) also asserts that new technologies within Higher Education (HE) have vast potential to effect change by enabling universities to meet a broader range of learner’s needs through acclimatization of a mixture of traditional teaching methods, face-to-face and online learning possibilities that would allow learners to study anywhere anytime. This must be fully embraced to assure that HEIs provide the best learning experience for all students not only in Lesotho but across the globe.

It is firstly needed to establish whether there is a lack of digital media awareness and knowledge among private university final-year students in the Broadcasting and Journalism (BABJ) Programme at LUCT Lesotho. Indeed, evidence suggests that in most institutions, the usual teaching and curricula approaches still remain unchanged, while the technology is typically poorly adopted and underused in the lecture rooms. For this problem to be confirmed among LUCT students, a comprehensive study among the LUCT final-year students and Lecturers in the BABJ needed to be undertaken. Therefore, the problem that gave rise to this study thus was the need of ways in which to address the lack of awareness of DMT and the inability to use it among the HE setting. For this reason, the use of DMT among students will be determined looking at the current perspectives on DMT reported locally, nationally and internationally and how the possible shortcomings can be addressed.

1.5 AIMS AND OBJECTIVES

The aim of this paper is to explain the current situation of digital media usage from the perspective of final-year students in relation to teaching and learning as offered under the faculty of Communication Media and Broadcasting at Limkokwing University in Lesotho.

Main objectives of the study

1. To enquire on students' knowledge about DMT within the Higher Education framework.
2. To understand students' attitude on DMT (e-mail, social networks, face-book and WhatsApp) usage as sources of information dissemination and delivery by students.
3. To provide a general overview of the impact and effectiveness of using and adapting digital media strategies and techniques to relate, collaborate, get informed and to increase the interest level of students concerning general learning activities provided by LUCT in Lesotho.

1.6 RESEARCH QUESTIONS AND METHODOLOGY

In order to address the research problem, the following research questions were formulated:

RQ1: To what degree do students at LUCT engage in DMT usage for study related activities including e-books, e-journals, social media (Facebook and WhatsApp), TV news, online magazines and online newspapers?

RQ2: Do DMT platforms have an impact on increasing student learning competency and interactivity among LUCT students?

RQ3: What benefit do students receive in the use of DMT in HE?

1.7 RESEARCH DESIGN

This mixed method research design used LUCT as an institution of higher learning and private university of technology in Lesotho to ascertain the extent to which private universities were providing cross cutting edge digital technologies to support education and learning practices. The study design gathered information from the academic community in

order to gain better understanding on the changing nature of university teaching and learning in the modern digital environment and global internet economy.

SAMPLING TECHNIQUE

Simple random sampling was used to choose students who participated in the study. Lists for all students in the Broadcasting and Journalism program were obtained and their names were then randomly selected. Random selection was employed to ensure that every student had an equal opportunity to be selected and participate in the study. This ensured representation and made it easier for results to be generalized to the whole population and ultimately prevent bias. As a results a total 54 respondents were chosen to represent students in final-year program at LUCT.

To better facilitate the study, a questionnaire comprising of a six-point Likert scale (quantitative), and items presented in the form of statements for qualitative data was formulated. These items were categorised into six sections. Students rated each of these items according to the response options: 1=Strongly Agree, 2=Agree, 3=Agree Somewhat, 4=Disagree Somewhat, 5= Disagree and 6=Strongly Disagree.

DATA ANALYSIS

Data obtained from questionnaires and items presented in the form of statements for qualitative data was organized and analyzed into appropriate themes and was presented in frequencies and percentages.

1.7 DISCUSSION OF FINDINGS

First, descriptive statistics regarding the confounding variables (gender and age) is provided in terms of categorical variables. Second, the quantitative data gained from the questionnaires is discussed. Lastly, the qualitative data gained from the questionnaires is also discussed.

1.7.1 Frequency procedure: Gender

The gender distribution of the study is provided in Table 1.1.

Table 1.1: Gender distribution of the LUCT final-year respondents in the sample (N=54)

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Male	19	35.1	35.8	35.8
Female	34	63	64.2	100.0
Total	53	98.1	100.0	
Missing System	1	1.9		
Total	54	100.1		

The sample size for the gender distribution results provided in Table 1.1 is 53; because 1 of the 54 respondents did not indicate their gender. Table 1.1 demonstrates that the majority of

students in this category were female, being 34 (64.2%) as compared to 19 males (35.8%). While only 1 LUCT final-year student (1.9% missing data) did not share their gender showing that more female LUCT final-year students (34) have registered for the academic year 2016/17 in the Communication programmes (LUCT RD 2014).

Frequency procedure: Age

The age of the respondents varied between 18 to 44 years. The respondents were divided into the following four categories, namely: 18 to 24 years, 25 to 31 years, 32 to 37 years, and 38 to 44 years respectively as indicated in Table 1.2 below. The reason for starting the first category from the age of 18 years is because 18 years is the entry age for first-year students to enroll at universities in Lesotho.

Table 1.2: Age distribution of the LUCT final-year respondents in the sample (N=54)

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
18-24 years	30	55.6	57.7	57.7
25-31 years	5	9.3	9.6	67.3
32-37 years	14	25.9	26.9	94.2
38-44 years	3	5.6	5.8	100.0
Total	52	96.4	100.0	
System	2	3.7		
Total	54	100.1		

The sample size for this result is 54 for LUCT final-year students in the faculty of Communication. The respondents' age in this study are represented in Table 1.2. It shows that 57.7% of the respondents were aged between 18 and 24 years, and those between the ages of 25 and 31 comprised only 9.6%; 32-37 years constituted only 26.9% and, lastly, 38-44 only 5.8%. Hence, the majority of LUCT final-year students in the Faculty of Communication's age were between 18 and 24 years. This indicates that the majority of the LUCT final-year students are relatively young and they started studying immediately after completing Grade 12.

Table 1.3 Knowledge about DMTs and its integration in teaching and learning

Item	Agreement = Strongly Agree (1) + Agree (2) + Somewhat Agree (3)	Disagreement = Somewhat Disagree (3) + Disagree (4) + Strongly Disagree (6)
II I know what digital media technology is	96.3%	3.7%

I2 I have used information from e-books, e-journals, e- magazines and online newspapers at the LUCT e-library.	70.37% *6 missing	18.51%
I3 To my Knowledge, computer awareness skills including digital media technology applications are taught at LUCT.	96.29% *2 missing	0%
I4 To my knowledge several instructors for Broadcasting and Journalism use digital media technologies in class quite often.	27.77% *3 missing	66.66%

***All values in the table are presented in percentages.**

The majority of the final-year respondents (**96.3%**) as shown in table 1.3, agreed that they knew about DMT while only a small number of these first-year respondents (**3.7%**) did not seem to know or ever heard of it. This shows that the majority of the LUCT final-year Communication students were trained on using DMTs including using e-books, e-library, e-journals, online-newspapers as well as online-magazines though **66.66%** could not recall of their lecturers ever using DMT in class quite often.

1.4 Students' Attitudes toward DMTs in HE

Item	Agreement = Strongly Agree (1) + Agree (2) + Somewhat Agree (3)	Disagreement = Somewhat Disagree (4) + Disagree (5) + Strongly Disagree (6)
II5 My approach toward learning improve when using digital media technologies in class	92.3% *0 missing	3.7%
II6 Digital media technology platforms form part of our everyday learning at LUCT..	0% *20 missing	100%
II7 With DMT I am able to learn almost anywhere and anytime.	87% *2 missing	9.3%
II8 I quickly forget what was verbally taught to me in class but do remember digital technological lectures.	92.6% *0 missing	7.4%

II9	I learn better when using DMT in class than if I just read and listen to my academic advisor in class.	81.5% *0 missing	18.5%
II10	I get a lot satisfied when using DMT in class as it allows collaboration and interaction with peers in class and outside the classroom.	94.4% *0 missing	5.6%

***All values in the table are presented in percentages.**

It is clear from the responses given in Table 1.4 that the majority of LUCT final-year Communication respondents (92.3%) learn better with DMT however all students (100%) did not agree that DMTs were often used in class for teaching. Only 9.3% of these respondents indicated that it was not flexible enough to allow them learn anywhere and at any time. The results also indicate that the majority of final-year students were inclined to demonstrate a higher confidence level towards online learning than others do. In the present study 85.5% of the students as compared to 18.5% learned better through DMTs than having to listen to their academic advisor's lecture. This might suggest that other students might have difficulty with lower confidence levels to the use of DMT. The lower confidence level may create barriers that limit the opportunities and choices for students in achieving a positive academic learning experience through DMT.

1.8 QUALITATIVE DATA ON HOLISTIC ASPECTS OF DMTS

The following qualitative data have been obtained from the open-ended item responses from the questionnaire.

1.8.1 Benefit of using DMTs in Academic Setting

The LUCT final-year students indicated the following as benefits for using DMTs for as a component of teaching and learning. This is evidenced by the remarks quoted below:

- It is easy to use and very fast
- Always available anytime anywhere
- Gives a lot of information than having to listen to verbal lectures.
- Storage is good for later retrieval of information
- Easy access to e-books, e-journals
- Opportunities for interaction and community engagement
- Growth of ideas in terms of creating blogs, podcasts, videos, and gaming sites
- Lectures tend to be easily understood.

The statements quoted above indicate the diverse opinions of final-year students in Broadcasting and Journalism. The results confirmed that students engaged in DMT not merely because of leisure but for better access to information and improving on their studies. With technology moving out of the lab and into classroom, DMTs are immensely affecting teaching and learning practices with digital technological tools. As a result, the outcome suggests that final-year students are able to access information and knowledge resources from the comfort of the available digital technologies offered at LUCT.

1.8.2 Students' satisfaction with DMT use in classrooms

It is evident that LUCT final-year students confirmed their satisfaction with DMT incorporation into everyday teaching and learning (which are in line with the findings based on the following questionnaire responses):

- Satisfied because we are allowed to use any digital media applications in class or during lectures.
- Excessively satisfied because with Digital media, I find what I am looking for within minutes.
- Using digital media technology especially the use of social media in class affords me the opportunity to get ideas from professionals such as scholars and professionals.

1.9 CONCLUSION AND RECOMMENDATIONS

1.9.1 Conclusion

Students are clearly optimistic about DMTs and this shows their satisfaction with incorporation of digital media technologies into teaching and learning as they felt that this practice assist them in interacting with lecturers and peers conveniently. This is indicative of the need to adopt various technologies into institutional curriculum to make it easier for students to choose the best methods applicable to them. Students were of the view that using these DMTs provides them with the opportunity to learn better and that traditional methods of teaching should be minimized to give way for DMTs to be fully adopted into the curriculum. This is also an indication that traditional methods of teaching are gradually diminishing and needs to be transformed as students prefer to use DMTs to share information and resources and to convenient interaction with educators and peers. LUCT Broadcasting and Journalism students view DMTs as a very powerful tool in the assistance of collaborative learning that aids in the understanding of combined efforts in the imparting of knowledge and skills. Majority of students have shown great optimism over the adoption of DMTs, to improve on traditional teaching methods and indicate that these applications have helped them to understand their courses better. This call for more research on how DMTs can be add on existing curriculum to allow for collaboration between students and lecturers and peers.

1.9.2 Recommendations

The study recommends that education and knowledge environments in academic institutions must provide innovative digital technologies to reduce the digital divide and increase learning opportunities to the new generation of students. DMTs should be seen as a participatory Learning paradigm that supports learners to enhance effective pedagogy. They should be used as a direct substitute of what is already happening in the classroom without changing any setting regarding teaching and learning allowing both the learner and facilitator to redesign any given task.

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UNDERSTANDING STUDENTS' AFFORDANCES OF NEW MEDIA TECHNOLOGIES IN OPEN DISTANCE LEARNING AT UNISA

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Abstract

The education sector is bristling with the discourse of incorporating new media technologies (NMTs) into the learning experience of students. This rapid shift is fostering reform movements and transformations in the education sector with varying implications, opportunities and challenges in educational practise, for both academics and learners. This paper examines challenges faced by both academics and learners when using technologies to improve teaching and learning in the context of ODL. The study restricts its focus to one region and uses the unified theory of acceptance and that of technology (UTAUT) as its theoretical lens. The UNISA's Bloemfontein region that involves adult students who come from differing backgrounds encompassing, inter-alia, poor financial, socio-economic, educational and technological challenges is selected for this study. Influenced by these backgrounds, some learners experience difficulties when trying to access the necessary technologies to use for academic purposes. The study employed a qualitative approach, using focus group interviews with UNISA adult students. Data was analysed through descriptive and thematic categorisation. The study found that the great proportion of Bloemfontein region's students came from remote rural areas and have limited access to technologies, which ultimately impact on their academic performance and result in low retention and success rate. We therefore conclude that there is a relationship of academic achievement between the geographical setting/location of students and their accessibility to NMTs. We further propose that ODL institutions should expand access to technologies for affected areas through establishing learning support centres and encourage learners to use them for learning purposes.

Keywords: New media technologies, students' access, distance education, open and distance learning, retention, online learning.

Introduction and Background

New media technologies appear to offer unprecedented opportunities for both students and lecturers for teaching and learning in distance education, in higher education in general and UNISA in particular. Very frequently learning is thought of in terms only of adding more knowledge, whereas lecturers should be considering also how to bring about change or transformation to the pre-existing knowledge of their students (Thomson, Bridgstock & Willems (2014). NMTs have enhanced connectivity between individuals, within higher education institutions and between students. Much of this connectivity has augmented

interactivity and reciprocity between students and lecturers (Anderson, 2008; Garrison, 2009; Alfonso, 2012). The use of technology differs according to context. However, many students studying in distance education institutions face challenges that relate to lack of technological resources, popularised as (NMTs) such as a computer with the internet, smart phones, tablets, and iPads (Shaikh & Karjaluo, 2014). These limiting factors contribute to poor academic performances of the students, decreased success and high retention rate.

However, the change from distance education (DE) to open distance education and learning (ODeL) has challenges not only for students but for the institution as well. Data reveals that, the foremost student cohort that is adversely affected by inaccessibility of new media technologies reside in remote rural areas where many households are characterised by poverty, lack of financial means, poor academic history and low technological infrastructure (Minnaar, 2011). Minnaar adds that students have to receive financial support to access technologies, and other forms of support in enhancing their understanding of such technologies as well as how to use them. Students' access to NMTs has become an inevitable research focus and this study seeks to address it within the borders of open distance learning (ODL), limiting its scope to the South African distance education context. The use of technologies has permeated distance education and subsequently redefined the way open distance learning environments implement teaching and learning. The student population involved in online learning has increased over the past decades, and such a form of academic engagement became popularly labelled as e-learning (Venkatesh, 2005) e-learning encompasses accessing study materials, communicating with academics and other students, and interacting with learning content on line, in order to get support during the study process (Minnaar, 2011). It resembles a virtual classroom in ODeL context (such as UNISA) where contact, support, teaching and communication happens on-line through the use of Information communication technologies (ICT) and related software.

The continuous evolvement of ICTs and their key character of new innovations have not escaped the interface with the physical world where economic principles of scarcity still apply (Mbatha, Ocholla, & Le Roux, 2011; Mbatha, 2014; Stanciu, Mihai & Aleca, 2012). The disparities in wealth and its distribution, also endemic in the education sector continue to underpin issues of access. There has been a claim that despite its ODL pursuits, UNISA fails to support students who do not share contextual features of those living in cities and have easy access to various technologies. The variances in access appear to counter the UNISA policy of migrating to an ODeL platform as they threaten to exclude students from disadvantaged background from this migration. The study therefore suggests that it is important to consider issues of inequality as addressing them could be an antidote to students' access problems.

The aim of this study is twofold: Firstly, to determine challenges faced by open distance education students in accessing technologies for teaching and learning. The research study could provide information on how to effectively navigate the new terrain of NMTs to enhance the disadvantaged students' learning experience. Secondly, to find out if there is a

correlation between the geographical setting and the accessibility of NMTs and student performance. After outlining the relevant literature related to the study and theoretical framework on which this study is based, the findings are then reported and discussed and the article ends with concluding remarks and recommendations.

Theoretical considerations

The underlying question in this article focuses on why students are not using new media technologies in their learning experience. However, it appears, there is a practice of disinclination by students in the use of new media technologies in their studies. Using the, *unified theory of acceptance and use of technology* (UTAUT), the study seeks to offer explanations to the students' acceptance or rejection of new media technologies (Venkatesh, Morris, Davis & Davis, 2003). The UTAUT model integrates the eight theoretical models and is composed of the core determinants of usage intention. The theory proposes significant strides into the usefulness-intention relationship between students and their use of new-media. The UTAUT is therefore well-suited to the context of this study because it offers explanations to two key variables, user intentions and usage behaviour.

This theory postulates that *performance expectancy, effort expectancy, social influence and facilitating conditions* influence students' acceptance outcomes (Sun & Zhang, 2008). However, the level of acceptance and use of new technologies also depend on the students' benefit in using these new technologies, the ease of use, the extent to which lecturers use these technologies and student's support. Furthermore, the students' readiness, their voluntariness and an enabling environment for learning accelerate their acceptance and use of these new technologies. This is in harmony with University of South Africa's (2008) contention that Open Distance Learning focuses on removing barriers to access learning, flexibility of learning provision, student centeredness, supporting students and constructing learning programmes with the expectation that students can succeed. In this case students' *perceived enjoyment* in using and accepting technology plays a major role.

In the context of technology acceptance, *perceived enjoyment* is considered as *intrinsic motivation* (Davis, Bagozzi & Warshaw, 1989). According to Tomei (2008) successful learners in on-line courses are a selected group, motivated, self-directed, comfortable with using technology, not afraid to experiment, and are able to work alone with minimal guidance. This demonstrates that the use and acceptance of new technologies is important to learners at a personal level (Hu & Tsai, 2009). In this connection, it should be emphasised that the main reason why students use or not use learning new media technologies in their studies could be due to perceived enjoyment or discontentment.

A key basis for using the UTAUT and its pillars is that it provides a basis for tracing contextual factors that influence attitudes, beliefs, motivations and intentions for using new media technologies.

Applying the theory to the study

The social influence and facilitating conditions provide a firm foundation to the explanations and insights into the heterogeneous structure of the beliefs and motivations underlying student user acceptance. The performance expectancy theory refers to the degree to which an individual believes that using a particular system would improve his or her performance (Jambulingam, 2013). In the UNISA case, new media technologies are built on the idea of interactivity. It is therefore assumed that these media technologies can bridge the gap between students and lecturers or students and students by collapsing the distance. Interactivity stands for a more powerful sense of use engagement with media texts, a more independent relation to sources of knowledge, individualised media use and greater user choice (Lister et al., 2005). Consequently the interactivity tool is expected to enhance the UNISA student's learning experience. However there are also some technical limits to the use of new media tools. This is addressed by the effort expectancy pillar.

The effort expectancy refers to the degree of simplicity associated with the use of a particular system (Ventakesh et al., 2003). The adoption of a new tool is also determined by how simple it is to use, particularly for students who already have work overwhelm. For example, a particular tool may have many embedded links that may lead to different links in the process creating challenges for the deliverance of a coherent learning experience. So there is a challenge of managing information overload. Such experiences, whether positive or negative could create other ideological connotations that largely shape students' attitudes toward the use of new media technologies. The discussions and consequences of effort expectancy overlap and are connected with discussions of the third pillar, the attitudes towards using technology.

Challenges in accessing NMTs

The use of new media technologies has widely become universal in open distance education. Their proliferation/ spread and worldwide usage in tertiary education market emanate from the multifarious advantages they offer in teaching and learning. According to Thomson et al. (2014), improved technological infrastructure in universities expands access to education through a range of data-enabled mobile services and computers. Jambulingam (2013) insight into the benefits of podcasts in teaching and learning reflect that they are important in information sharing between the students and their lecturers without time-based and geographical constraint. Irrespective of an array of benefits NMTs offer to the global tertiary education sector, some parts of the countries around the globe still experience challenges regarding access to them. This problem has been popularised in the gamut of literature as the digital-divide. This study is tailored to examine the problem of students' access to technologies used for teaching and learning, and narrow its focus to UNISA's Bloemfontein Region which are used by students from diverse backgrounds (both rural and urban areas). It is deeply ingrained within the present lack of studies focused into addressing the access component within the Bloemfontein region. Numerous students at UNISA do not use NMTs technologies, even though an emphasis to use them is required across the entire student

population. The study adopted the UTAUT as a lens with which to explore the access-oriented challenges that students face in these regions.

Research Methodology

To answer the research question for this study, a qualitative research design was adopted. Qualitative research allows the researcher to investigate behaviour as it takes place naturally in non-contrived situations. Newman (2014) believes that generally, qualitative research is suitable for studies designed to expand our knowledge of the substrata of complex phenomena—such as the details of students’ experiences as they move through an educational intervention, the reasons behind individuals’ stated opinions about a political issue, the nature and quality of interpersonal factors at play in any environment, and so on. Cohen, Manion and Morrison (2011) posit that such design is sought as a means of addressing critical problems and improving practice. In this study it was envisaged that the design could help uncover the perception of students on the use of new media technologies at UNISA. This understanding was expected to culminate in improved teaching and learning practice at UNISA. The sample comprised twenty convenient sampling UNISA students from Free State regional office. These students were sampled because they were deemed best to provide the information needed to address the aim of the study.

The purpose of the 60 minutes’ focus group interviews was to collect data from the facilitators about the process that followed to facilitate the programme. The responses from the interviews were recorded and were used to support and clarify the notes that were made during the interviews about their challenges and their benefits in using new media technologies to enhance teaching and learning. The researchers used the following steps in the process of analysing qualitative data, as suggested by De Vos, Strydom, Fouche, & Delpont (2011).

Preparing and organising the data which includes planning for recoding the data, data collection and preliminary analysis, managing the data and reading and writing memos. Reducing the data involves generating categories and coding the data, testing the emergent understanding and searching for alternative explanations, interpreting and developing typologies, visualising, representing and displaying the data and presenting the data.

The study observed ethical considerations permission of which was granted by UNISA. The regional managers granted the researchers permission to collect data. Participants were informed about their right to withdraw from participating in the interviews should they so wish. With their permission, the interviews were audio-recorded to facilitate collection of accurate information and later transcribed for analysis. Lastly, the respondents were assured of anonymity and confidentiality. The researchers ensured that all the findings were presented honestly/ truthfully.

Findings and Discussion

In this section, challenges through the eyes of students are presented. An analysis of the focus group interviews conducted with students revealed four common themes: 1) Lack of skills in using new media technologies; 2) Attitudinal and Social Challenges; 3) Infrastructural Challenge. 4) Affordance of NMTs. These four themes are discussed below:

Lack of skills in using new media technologies

The two pillars of the *Unified Theory of Acceptance and Use of Technology* (UTAUT), namely self-efficacy and anxiety are about the individual. Self-efficacy refers to the degree to which an individual judges his or her ability to use a particular system to accomplish a particular job or task and anxiety is about the extent to which one is anxious or emotional reactions associated with the use of a particular system. Most of South Africa's HI students are found in rural areas, where technology is a foreign phenomenon. Majority of students from rural places struggle to use computers, let alone surf the net. Some of them have never even touched or seen a computer in their lives. The regional centre under study is one of the learning sites that serve mostly rural students. The scholars in the field concentrated more on the impact of technology in education, whereby they recognise that if technology is inappropriately used, it will not yield the desired outcomes with regard to teaching and learning.

When asked to comment on the types of e-learning resources that are currently used by lecturers and students, it emerged during the interviews that UNISA students have a variety of challenges regarding the use of NMTs for their teaching and learning. One of the participants, who was supported by others, indicated that:

'I still post my assignment at the post office, it is less stressful and I only use my phone to call my lecturers when I need help'.

'I use myUnisa to send my assignments, I receive electronic feedback late with no comments just ticks and a mark from the lecturer just before the exams, it is frustrating.

From the above assertions, the concerns expressed by students reflect discomfort. It can be said that marking an assignment in an ODL environment is not about ticking the correct answers, but managing the emotional aspects of students, which are often neglected.

NMTs can be expensive for some students. In support of this finding, another participant shared the following:

Not all of us have access to the internet unless when we are on campus. I do not have devices like laptop or a computer or smartphones.

One participant commented that *I am not computer literate, I was born before technology.*

For challenges in relation to using NMTs in their learning, of and the demands of myUnisa, among the challenges, some students indicated that their *'gadget space limit cannot accommodate the volumes of myUnisa'*, and in terms of affordability, they indicated that they cannot *'afford the new smartphones that can help them to access required information from myUnisa'*.

Although is premised upon a social/ cultural/historical structure, the individual is not reduced to society/ culture. For instance, the author of this paper thought that students who come from urban regions will have more access to NMTs than students who come from predominantly rural regions, it was not the case. This relationship between an individual and the society in terms of agency of an individual can be misunderstood or misinterpreted as providing deterministic model of individual use or non-use of NMTs. Students varied from techno-active to technophobic irrespective of their backgrounds and location. Due to lack of proper training in e-learning technologies, the students indicated that they are not *interested in NMTs and they do not see the need for using NMTs for learning*. These responses came from participants; *I have the latest technological equipment* and they indicated that they are *not technophobic*.

Attitudinal and Social Challenges

The attitude toward using technology refers to the degree to which an individual believes he or she should use a particular system (Venkatesh et al., 2003). There are several works in literature which themselves explore the relationship between the users' culture and the adoption of new media technologies (Aldeman, 2012; Hutto, Trehitt & Briscoe, 2011; Du, Whinston, Lu & Liu, 2010). One example is the hesitancy by both staff and students in adopting NMTs due many other reasons that may range from work overload to organisational inertia. More often than not, each student and within the course or subject brings their history regarding their experiences of e-learning facilities and this affect its usage in an ODL environment. The general attitude of some students especially the older and working adults is that NMTs are not critical to learning.

As the comments by students suggest, lecturers are not on board when it comes to the use of NMTs in their teaching. The next three excerpts below refer to the challenges brought by lecturers' inability to use NMTs:

Many times, difficulties in finding lecturers in an e-mail or discussion forum leave me with the feeling of hopelessness, especially when you are writing an assignment and you need clarity on a particular aspect, you feel completely lost.

I think the only technology most lecturers know and use is the Internet. Some respond promptly to e-mails but some take time and when they do their responses are very impersonal.

I need support with computer literacy. The resources like e-journals are available but we are unable to access them with ease.

I still need printed material because I don't have access to these NMTs technologies.

We are trained to use the facilities but it is a once off training, it is not sufficient.

This resistance to NMTs can be linked to the fourth pillar, social influence. Social influence is with regards to the degree to which an individual perceives that others believe he or she should use a particular system. The UTAUT calls for the guidance and students to work together to exceed what can be attained alone. Lecturers must be capable of providing learning experiences that challenge students to work within, and push beyond current levels of performance and develop new abilities.

Another key factor that can enhance or is linked to its acceptance is the organisational and technical support by UNISA particularly through policy and training amongst other factors.

Infrastructural and Constraints of limited resources

The social influence pillar is closely intertwined with the facilitating conditions pillar, which is about the extent to which an individual believes that an organizational and technical infrastructure exists to support the use of a particular system (Venkatesh et al., 2003). It is important to consider that the cultural reception of a new medium is always positioned in relation to existing media (Howarth, 2011). The contrasts with older forms therefore shape the expectations by society for one to use a particular system. If the new media is accepted due to its complementary and innovative nature to the previous forms it can then be socially accepted. Further challenges were identified in relation to limited spaces, few computers, and poor Internet bandwidths at the regional offices:

We have an excellent support from the regional computer personnel but the challenge is that I stay far from the city where the regional office is and coming to the region is the only way I can access internet to submit my assignments and use myUnisa. The main problem is the few computers at the region and the computer lab space cannot accommodate all of us, you have to wait in the que for a long time.

From nine thirty the internet at the regional office become very slow and at times it just shuts down and then you have to wait.

Online chat forums serve community of practice at UNISA, I have found it to be ineffective as responses to students' enquiries are lacking. Discussions are non-existent and feedback on assignments is always late and often not informative.

Student registration, where the whole enrolment process happens online is a very helpful and positive service especially at an academic institution like Unisa with hundreds and thousands of students. Students are saved from experiencing problems

Dey, Burn, and Gerdes (2009) argue that students arrive on campuses ready to engage information in new ways, only to find faculty who are reluctant to alter their traditional and entrenched teaching approaches. Kop (2008) focused on the reluctance of adult educators to engage with Internet technologies and indicated that adult educators themselves don't always feel comfortable with the new developments as they haven't been shown adequately or explored for themselves how the new and emerging technologies could enhance their working practice. Dwivedi, Rana, Chen and Williams (2011) recommends that these educators who have grown up with the technology needs more training in new skills. Laurillard and Masterman (2010) note that many teaching staff underuse the same few technologies, e.g. ineffective PowerPoint presentations and VLEs as mere repositories. They highlighted that although the use of these technologies is now widespread and increasing, it is not always optimised for effective learning. Therefore Bouchard (2011) calls for the need to develop teaching staff to embrace a new pedagogy, considering new models of teaching in response to the rise of social media and learning technology. He suggests a move towards "pedagogy of abundance" in a technology rich environment to cope with the free-flowing, open ended character of learning via social networks (Bouchard, 2011); Ng'ambi, 2013). Mayes and Morrison (2008) maintain that in online learning environment lecturers need guidance in the art of scaffolding as they learn to use online support tools such as email, discussion boards, web video conferencing, etc. The use of NMTs in teaching and learning has created a tremendous pressure for adult educators or lecturers to know the levels of technology skills they need to perform the learning activities.

Affordance of NMTs

Majority of students serviced by UNISA are from disadvantaged backgrounds and cannot afford technological devices. Students' lack resulted into reliance of the universities' computers and the compelling need to use what is at their disposal. The students' perception over the use of these borrowed devices varied and was mainly influenced by their interest or not in ICT generally. Akbar (2013) highlights the significance of making the environment conducive for students prior to the use of new technological devices in particular. Inability to own personal devices may give false impression regarding students' acceptance of methods of technology. Students' agreeableness or not in this instance may be influenced by them accepting their plight (non- affordance) or otherwise. Students had this to say,

I struggle to raise money for my studies. My uncle and grandmother are not working. Technology is a luxury that I cannot afford currently. My cell phone is for communication only. You know, making and accepting calls. I started using a computer from an internet café. So it's hard for me to make ends meet.

I cannot afford these NMTs, so printed material is the only option I have. I can only use NMTs on campus which is a shared facility. Therefore, I can't really say I'm used to them. Another thing is that I'm not used to them, I find that I'm struggle using them.

My hope is to get this qualification and get a job. Only then can I be able to afford some of these things. Maybe when I do my next qualification I'll be having a laptop. For now, its old school.

These assertions expose the difficulties some students endure due to socio-economic challenges. These students need monetary assistance to acquire technological devices for their education. Minnaar (2011) affirms that it is essential for students to get financial support if they are to access technologies and their use, particularly in ODL institutions such as UNISA. Students from disadvantaged backgrounds find themselves repeatedly deprived as a result of where they come from and factors linked to poverty. This may result into a descending behaviour towards the use of technology. Jambulingam (2013) posits that the issue of affordability is a construct that was found to have been amongst factors influencing behaviour of students regarding the use of technology in their studies. Consequently, they struggle through their learning because of non-affordance. It is for this reason that they should be prioritised and resources be made available where they can be readily accessible ease of access.

Limitations

Whereas the strength of the findings rests within the integrated use of multiple lenses to describe and explore the phenomenon, the research is also characterised by some shortcomings. Owing to the focal point of the study which centred its exploration into open distance terrain, caution should be exercised in the application of findings of this study in other educational contexts such as the residential universities. The sample size used to collect data was also small - one university within which only one of the eight local regions were researched. Further to this, a total of 20 for interviews are small, considering the magnitude of UNISA that comprises the variety of branches, both locally and internationally. There is no reliability on representativeness of students who participated as sampling was based on convenience and purposive techniques.

Conclusion and Recommendations

This article was aimed at examining the relationship between the geographical setting and the accessibility of NMTs, and establishing challenges that students experience with regard to accessing NMTs used for teaching and learning in an open and distance learning institution. UNISA was used as the distance educational context. The interview respondents revealed that there is significant relationship between the geographical setting and the accessibility of NMTs. Grounded on this result we deduce that remote rural students face inaccessibility challenge to NMTs used for teaching and learning and that those who are proximal to the regions are better off to access and use NMTs than the rural students. The findings showed that the greater proportion of the UNISA's student population in the Bloemfontein region have no access to many of the NMTs used for pedagogical purposes. These findings suggest that there is a need to provide technological support interventions to the affected cohort. Furthermore data reveals that many students reside in remote rural areas and have no access

to relevant NMTs which they can use to fulfil the learning involvement. Being isolated from the region undesirably impact on their academic performance and result in low retention and success rate. Inherent into this concern, is an insinuation that students from Bloemfontein region adversely experience a digital-divide problem that subsequently contribute to low access to and usage of NMTs used for teaching and learning. This suggests that, speculation maybe students do not take it seriously, such as access, and so on.

I recommend that learning centres be built in pastoral far-flung areas and computers with internet networks be supplied to increase accessibility to NMTs and their adoption and usage should be maximized through students' reinforcement. Further to this necessity, intervention programmes such as training initiatives are pivotal in transferring technological competencies and to stimulate students' e-readiness. An inclusive research focused on all UNISA local eight regions and its other international centres is necessary for expanding the scope for understanding of digital-divide problem and challenges attributed to inaccessibility to NMTs used for teaching and learning. Further to this proposal, the e-readiness aspect demands an inquiry to establish if the resistant character to adopt technologies for teaching and learning exists among isolated rural students.

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AN EXPLORATION OF HOW SOCIAL MEDIA CAN FACILITATE LEARNING IN TERTIARY INSTITUTIONS IN LESOTHO

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Abstract

Social media platforms are readily available to the majority of tertiary students in Lesotho but very few harness this technology for academic purposes. There is limited literature in Lesotho for guiding tertiary students on how to make meaningful use of social media platforms for academic purposes. This study therefore explores all the avenues possible for tertiary students in Lesotho to capitalise and make use of social media platforms to enhance their studies. Questionnaires were distributed to and completed by students from eight tertiary institutions in Lesotho. Interviews were also carried with lecturers from the three institutions as well as with officials from the Lesotho Communications Authority. The study explores what social media platforms are mainly used by tertiary students, the infrastructure in place in Lesotho and the infrastructural capacity for maximum use by tertiary students for academic endeavours. The study also explores the social media legislation in Lesotho in order to establish its strengths, weaknesses, opportunities and threats to academia. Results indicate that 92.5% have access to the internet on two or more gadgets and the most used social media platform is Facebook (95%), Whatsapp (92.5%) and Twitter (70%). The main use for social media platforms by students is for social purposes (71.3%). Students also regard social media as positive to their academic pursuits. If properly harnessed and utilised, and properly supported, social media has the potential to enhance the academic pursuits of tertiary students in Lesotho.

Keywords: Social media, Social Network Sites, learning, student-engagement and legislation.

1. INTRODUCTION

Social media refers to computer facilitated social networking internet sites. Social networking sites are defined by Boyd and Ellison (2007) as cited in Eke, Omekwu and Odoh (2014) as services hosted by the internet that permit users to build public or semi public profiles within a certain system and they can share with other users. According to Selwyn (2012), social media (web2.0) use can be described in terms of collaboration, conviviality and creativity. Currently, there are more than 200 social network sites in the world which are focused for different types of audiences. Users of social media to go on line share and rate, mash-up and re-mix, friend and trend. The number of users on a Social Network Site (SNS) such as Facebook is over 1.2 billion users and Twitter has over 650million users; universities cannot be left behind in creating their own 'fan pages' to ensure they are always in touch with their

'fans'. Colleges and universities are beginning to embrace social media and realising the potential power and implications (Reuben, 2008).

Srivastava (2012) identifies the benefits of social media for tertiary students as collaboration of educands, development of creativity, networking, free business promotion, ease of communication, development of cognitive, affective and conative domains, educational benefits (low income students become technologically proficient) and enhances expression of oneself (Srivastava, 2012). In Lesotho there are fifteen tertiary institutions grouped under private and public. Eight are public and seven are private. Although a low income country, (about 40% of the population lives below the international poverty line of US \$1.25 a day), many tertiary students in Lesotho own a mobile device or have access to computers which they can use to connect to the internet.

Social media is at the disposal of students in tertiary institutions and it can be very beneficial if properly used. However, for Lesotho, literature to properly guide tertiary students for the harnessing and effectively utilising social media platforms for academic purposes is not readily available. This therefore leaves room for tertiary students to fail to make meaningful use of assets readily available at their disposal to the disadvantage of their academic pursuits. This study, therefore, seeks to explore all the possibilities of social media's enhancing tertiary students' academic endeavours.

This study seeks to establish the extent of use of social network sites (SNS) by students for academic purposes, explore how tertiary institutions in Lesotho are using the SNS to facilitate learning and analyse the legislation in Lesotho in order to establish its strengths, weaknesses, opportunities and threats to academia. The research questions are:

1. What are the most popular social media platforms used by students?
2. Is social media used for academic purposes?
3. Whether tertiary institutions are facilitating learning with the use of SNS?
4. To what extent does the law interfere with SNS use?
5. Does Lesotho have SNS infrastructure in place for use by students for academic purposes?

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

This study is informed by the Uses and Gratifications theory of communication. Uses and Gratifications theory is relevant to social media because of its origins in the communications literature (Whiting & Williams, 2013). According to Ruggiero (2000); "Early in the history of communications research, an approach was developed to study the gratifications that attract and hold audiences to the kinds of media and the types of content that satisfy their social and psychological needs" (Cantril, 1942). Uses and Gratifications theory proposes that media users are actively choosing specific media content according to their needs (La Rosa, 2010). Instead of asking what media do to people, the theory of Uses and Gratifications asks, "What does an active audience do with the media, why, and with what effect?" (Lasswell, 1948 in Zhang Xu, 2012).

This is also the most relevant theory to guide this study considering that social media has opened up a wider opportunity for media of choice for interaction both socially and academically for 21st century tertiary students. This is so because social media offers a wide variety within the social media spectrum itself without including traditional mainstream media such as the print, radio and television. The study therefore seeks to establish, within tertiary students of Lesotho, which social media platforms satisfy the tertiary students' needs the most.

Social media networking is used, especially by the younger generation for different purposes. Apart from academic pursuits, young adults use social media for networking, creating and maintaining relationships on and off campus (Sponcil and Gitimu, 2014). With tertiary students, Facebook is the social media site of choice, followed by Twitter with LinkedIn as the least popular (Ezumah, 2013; Cheung, Chiu and Lee, 2011). Hall and Sivakumaran (2011) write that social media platforms help students studying abroad mitigate loneliness and homesickness. They say that social media helps students studying abroad to stay in constant contact with family as well as with former colleagues once they return home upon completion of their studies. However, much as tertiary students engage social media for socialization purposes, they also harness these platforms for academic purposes.

Students of the early 21st century have grown up under the influence of audiovisuals and the World Wide Web where they do social networking, blogging and have been empowered to share, create, inform and communicate (Gomez, Roses and Farias, 2012). Social media has, therefore, become a key element to their academic lives. This has been made readily available through the emergence of Web 2.0.

The term 'Web 2.0', according to Abbott (2010) refers to a manner of thinking regarding networked communications; a concerted and communal way of functioning underpinned by the key notion of the Web (rather than the desktop) as a platform. Web 2.0 is characterised by information sharing, personalised information use, Web-based communities, and Web-hosted services and applications (Abbot, 2010). Examples of characteristic Web 2.0 technologies are social networks, media-sharing sites, wikis, blogs, social bookmarking, folksonomies, syndicated content (RSS) and Rich Internet Applications (RIAs) (Abbott, 2010). These sites are widely used by students.

Dlamini, Ncube and Muchemwa (2015) cite Digital Directions, (2010) saying that social networking is so widespread and has taken root in education within students at tertiary level to the extent that focus in scholarly research on that subject matter has shifted from the role social media plays in education to what social networking tools work most favourably for tertiary students as well as to how best these platforms can be harnessed for the benefit of the students.

Making use of technology such as internet is one of the most essential factors that can impact educational performance of students positively or negatively. Shah (2001) in Mehmood (2013) writes that student users are affected by the internet and this influence is determined by the type of internet usage. They are positively impacted by the informative use of internet while having negative impact of recreational use of internet on them. For instance, YouTube provides a lot of videos that can be purely entertainment and with no academic value at all. Inexperienced users can spend a lot of valuable time on such a site at the expense of academic pursuit.

Chan and Leung (2016) in their research findings found that the use of social media facilitates communication and collaboration among users. In their study they used Twitter to support blended learning activities in two university courses and found that it was easy to use and could facilitate knowledge sharing among different learners. They also found that students preferred Facebook as it was more popular among students. SNS such as Facebook were found that they provide a platform for social networking, facilitating asynchronous and synchronous communication in an informal way which in turn encourages more interaction between students and teachers. Facebook also enables students to express their ideas in and after class and helps students to formulate their thoughts with the support of multimedia contents such as pictures, videos and hyperlinks to other sites.

Legislation and policies can either promote or prohibit use of social media. Willems, Adach and Grevtseva (2016) concluded that it is important for social media policy to be adaptive, current and able to provide clarity around interpretation of specific policies which relate to their desired teaching practice.

3. METHODOLOGY

This study employed the mixed approach using both qualitative and quantitative technique and instruments for gathering and analysing information. This will result in a more detailed and broader analysis of the subject in question. Questionnaires were distributed to students and lecturers from 8 different tertiary institutions in Lesotho and follow up interviews were made to fill in outstanding questions. Random sampling was used to select the tertiary institutions and to select the students for interviews. Random sampling ensures that everyone in the target population has an equal chance of being selected hence eliminating sampling bias. Questionnaires for students and institutions were used to collect the data which was analysed using SPSS. The face to face qualitative interview method was used to gather information from officials from the Lesotho Communications Authority.

4. RESULTS

The results are as follows:

Table 1: Summary of Respondents

	Frequency	Percentage	Cumulative Percentage

Gender	female	49	61.3	61.3
	male	31	38.8	100.0
	Total	80	100.0	

Most of the respondents were female students (61.3%).

		Frequency	Percentage
e-Technologies	computer	195	100
	laptop	163	83.6
	tablet	109	55.9
	Smartphone	180	92.3

70% of the students are in the age range 17 – 25 years. This age is regarded as the techno-savvy generation and as the results Figure 1 indicate, most of them (92.5) have access to internet on at least 2 or more gadgets.

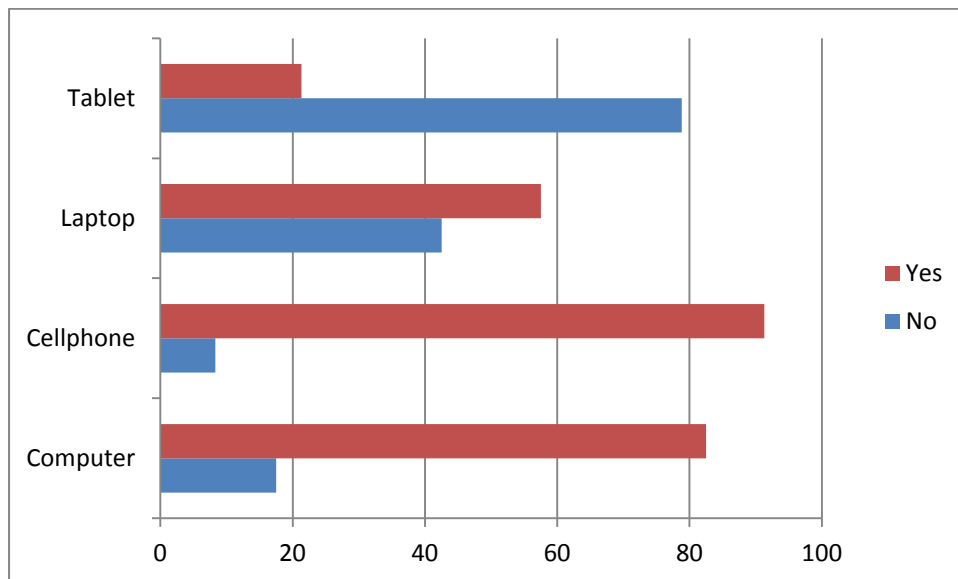


Figure 1: Main gadgets which respondents have access to internet

Most students (92.5%) own at least two gadgets where they have access to internet. The most common gadgets with access to internet are mobile phones and computers.

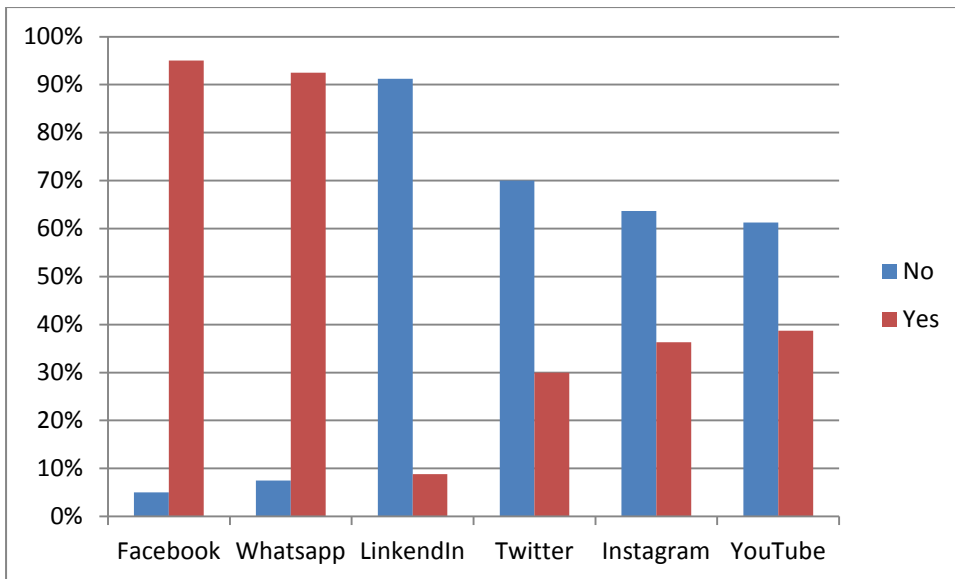


Figure 2: Social Network Sites used

The most used sites are Facebook (95%) and Whatsapp (92.5%), Twitter (70%), followed by YouTube (38.7%). The study also shows that there are applications which are rarely used such as Skype and Blogs.

Table 3: Average use of Social Network Sites (SNS)

		Frequency	Percent
Average Use of SNS	many times a day	65	81.3
	once a day	15	18.8

Most of the students use the SNS many times a day. Issue of multi-tasking e.g. while on SNS and at the same time having a group discussion.

Most students (70%) have joined the university/college SNS, and for those who have not joined, it was found that most of them were not aware of the university/college's presence on social media.

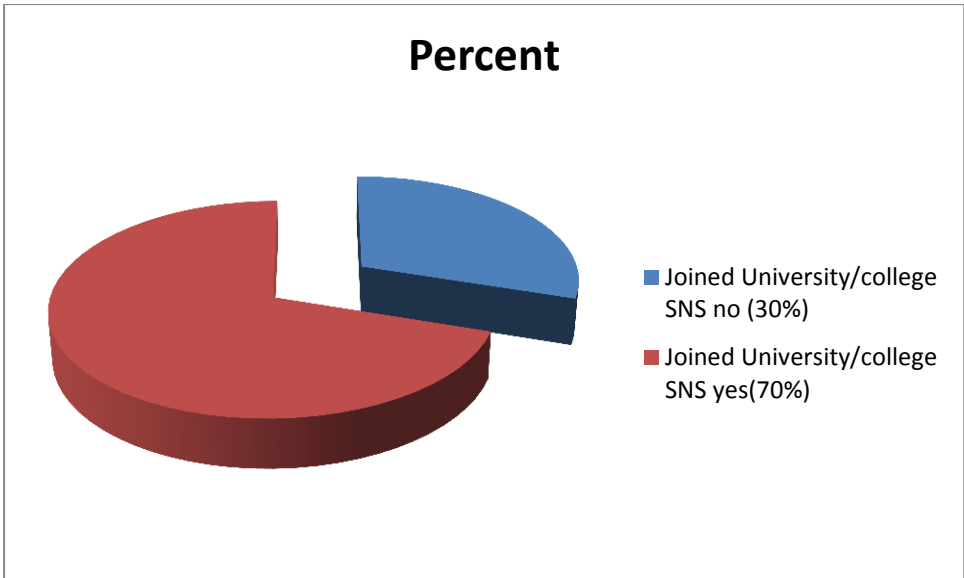


Figure 3: Respondents who have joined the university/college SNS

Table 4: Rating of the university/college SNS by respondents

		Frequency	Percent	Cumulative Percent
Rating the university/college SNS	excellent	6	7.5	7.5
	very good	4	5.0	12.5
	good	27	33.8	46.3
	bad	10	12.5	58.8
	very bad	6	7.5	66.3
	worst	3	3.8	70.1
	n/a	24	30.0	100
	Total	80	100.0	

Of the students who joined the university/college SNS, 46.3% rated it good or better and 23.7% rated it bad or worse. 30% could not rate as they had not joined the university/college SNS.

Table 5: Main use of social network sites

Main use of SNS	Frequency	Percent
Educational	23	28.8
Social	57	71.2

Most students (71%) used the SNS mainly for social and entertainment purposes.

As shown in Table.6 below, most students regarded social media as positive value to their learning and none regarded it as negative. However, it should be noted that there is evidence that social media has negative impact on academic performance, health, privacy and security issues (Abdulahi, Samadi & Gharleghi, 2014; Dlamini, Ncube & Muchemwa, 2015), addiction to the internet (Fenichel, 2010).

Table 6 Respondents' view of social media

	Frequency	Percent
neutral	22	27.5
positive	58	72.5
Total	80	100.0

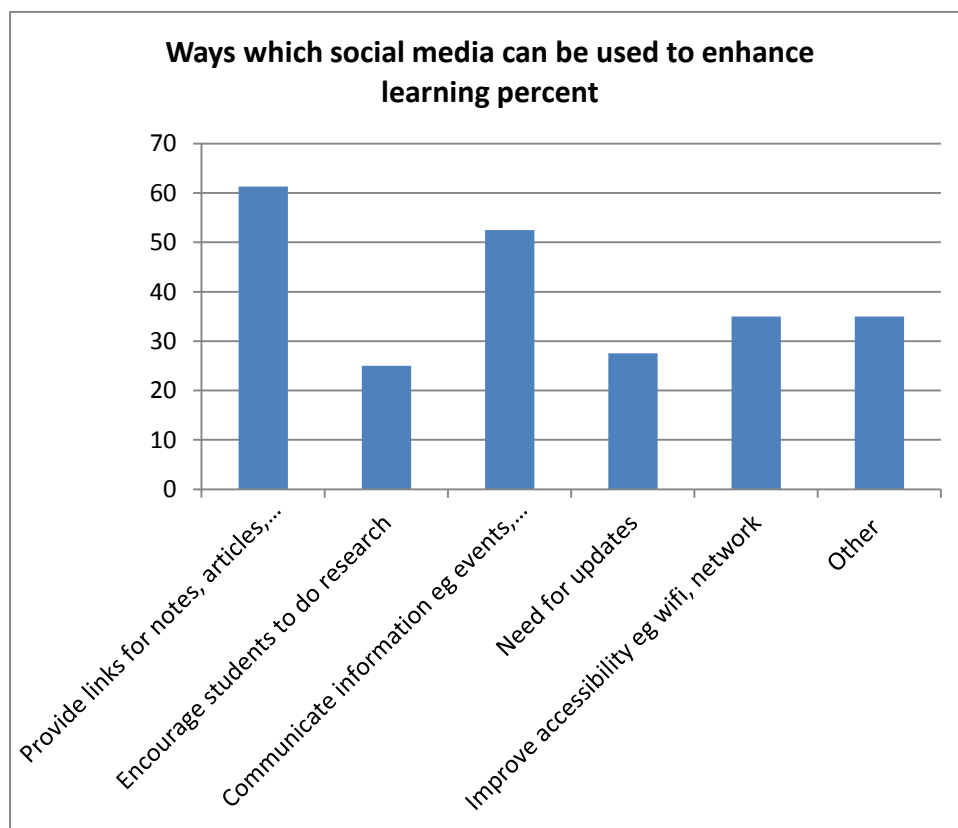


Figure 4: Ways which social media can be used to enhance learning

All the students responded that they use SNS for research, group discussion or studying and also personal use and only 21.3% use it for professional networking. All the students use social media to communicate with other students but only 30% use it to communicate with lecturers.

In regards to legislation, there is a Communications Act No. 4 of 2012 that acts as the policy to guide the telecommunications industry in Lesotho. The Lesotho Communications

Authority is the organization in place that ensures the regulation and operations are in place. The Communications Act No.4 Of 2012 replaced the following policies:

- Lesotho Communication Policy 2008
- Lesotho Telecommunications Authority Act No. 5 2000
- The Post Office Act of 1979

There is also a Draft Computer Crime and Cyber Crime Bill of 2013 that has not yet passed into law. The bill seeks to criminalise offences against computers and network related crime, collection of evidence for computer and network related crime; to provide for the admission of electronic evidence for such offences, and to provide for matters connected with or incidental.

5. DISCUSSION

Social media is a platform that educators can use to meet and interact with students in order to enhance their learning. Technology can either be a disruptor or enabler to people depending on how they use it. Although Lesotho is a developing country, the study has shown that most students have access to two gadgets with access to internet. It can be concluded that with tertiary students moving with the times; universities or colleges can take advantage of the low cost, instantaneous communication and collaboration, and accessible social media that students are already using and enhance student learning and engagement.

An assessment of the sampled eight universities/colleges' use of social media showed that most of the institutions use this platform minimally as the information on these sites showed that they are mostly promoting their programs to prospective students and communication of events to current students and alumni. The research findings show that most students use social media predominantly for social purposes rather than educational purposes and none of them viewed it as negative with regard to its value towards learning and the recommendation is that universities and colleges should organise seminars to enlighten students on the negative impacts of social networking (Omekwu, Eke & Odoh, 2014). This therefore means, social media platforms provide an opportunity for tertiary institutions to promote students' engagement in academic endeavours on and off campus.

As most universities and colleges are also now having a presence on SNS, the following key issues and how they apply in an African context should be considered: ownership and intellectual property, privacy, security, access and accessibility issues (Rodriguez, 2011). In addition to security, intellectual property and privacy concerns, tertiary institutions can upload notes, assignments and results on the student portal. Students can also complete their registration processes online and avoid the inconvenience of travelling all the way to college to queue up and register physically. This virtual environment will make life easier for students and lecturers. On the other hand there is room for tertiary institutions to encourage students to use social media to enhance learning, discussion and knowledge sharing (Manzira & Tsvara 2015; Chan & Leung 2016).

The results show that the most popular sites are Facebook, Whatsapp, Twitter and YouTube. These results concur with the findings from a study which was done in Zimbabwe by Manzira and Tsvara (2015) for a rural further educational training college. As all students indicated that they use social media for research, studying and group discussion, it would be more beneficial if universities/colleges would use this platform in a more beneficial way for students. Chan and Leung (2016) used Twitter and found it was easy to use and it facilitated knowledge sharing among learners although they highlighted that most students preferred using Facebook due to its popularity.

A third of the students had not joined the university/college SNS illustrates that universities and colleges need to increase awareness of their presence on the internet and this can be effectively done during orientation and important events. Social media can also be used as a tool by educators to promote out-of-the-classroom learning, contributions from shy students and continue to engage students after lectures.

The Lesotho Communications Authority has licensed three companies (Comnet Lesotho, Telecom Lesotho and the Lesotho Internet Providers Association) to provide internet services (LCA, 2014). This means the infrastructure is adequately in place especially in the urban areas where most of the higher institutions are located. During the Lesotho Institute of Accountants (LIA) 8th Annual Conference in October 2016, the Minister of Communications and Information Technology revealed that the government had plans of ensuring that all the tertiary institutions would have free wi-fi. If these plans are implemented, it would be an opportunity for tertiary institutions to take advantage of and use it to enhance learning making use of SNS.

Since there are no government restrictions on access to the Internet or government monitoring of e-mails or Internet chat rooms, tertiary institutions and students can utilize the available social media platforms to execute any research tasks of choice in academia without interference from the government authorities. According to the Lesotho Bureau of Statistics (2016), Lesotho has got a population of 2 million people, which is a significantly small population for three internet providers to service. However, Internet provision is not widely available as there are only 343 069 internet users and in the rural areas there are even very few users due to the lack of communications infrastructure and high cost of accessibility due to the mountainous terrain and low density in population.

6. CONCLUSION

This study explored how social media can facilitate learning in tertiary institutions in Lesotho. Social media platforms are readily available to tertiary students in Lesotho and if they are properly used, they can benefit students in their academic pursuits. The study is informed by the Uses and Gratifications theory of communication which states that audiences are attracted to the kinds of media and types of content that satisfy their social and psychological needs. The study established that, apart from academic pursuits, young adults

use social media for networking, creating and maintaining relationships on and off campus. The study also established that making use of technology such as the internet is one of the most essential factors that can enhance educational performance of students positively or negatively. The study employed the mixed method research approach as both qualitative and quantitative techniques were used to gather and analyse data. 70% of the students who responded to the questionnaires are of the age group between 17 and 25. 92.5% of the student respondents own at least two gadgets with access to internet connectivity. The social media platforms of choice by the students are: Facebook 95%, Whatsapp 92.5%, Twitter 70% and YouTube 38.7%. The rate of visits to the institutions' Social Network Sites (SNS) by students stands at 81.3% per day maximum and 18.8% minimum. Most students have joined their institutions' SNSs but other students are not aware of such institutional sites on the internet. Of the students who use their institutions' SNSs, 71% use them mainly for social and entertainment purposes. 72.5% of student respondents regard social media as positive to their learning. There is no law in place that directly interferes with internet or social media use in Lesotho, so users are free to utilise social media platforms. Social media is therefore a platform that educators can use to meet and interact with students in order to enhance students' learning process. Since this study has established the influx of social media use by tertiary students, it therefore would be recommended for tertiary institutions to carry out further research on issues of security and privacy violations by users so that these platforms are not violated or abused.

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TEACHERS' USE OF EDUCATIONAL GAMES IN MATHEMATICS PEDAGOGY AT THE FOUNDATION PHASE: A REVIEW OF THE LITERATURE

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Abstract

The use of game in mathematics learning is an up-coming area of interest while the integration of games in teaching is still a somewhat unexplored area of research. This article is a review of literature on practising teachers' use of educational games as pedagogical tools in the teaching and learning of Mathematics at the foundation phase. The purpose of this study is to gain an insight into the concepts of game, the role of game in the teaching of Mathematics, teacher's pedagogical activities together with the role of the teacher in game-based learning because teacher's pedagogical activities are vital in various game-based learning processes. The review highlights and suggests that teachers' roles about teaching and learning with games are central to integration. It is suggested that successful integration needs to address three interlocking frameworks for change: the teacher, the school and policy makers based on the notion that the perception or the orientation of the teacher including the skill, the vision of the school and the policy document perspectives on the issue are vital to intergration.

Keywords: Digital game-based learning, Educational games, Foundation phase, Pedagogy.

Introduction

Based on a wide range of regional, national and international assessments, mathematics education have become an issue of concern in South Africa, Fleisch (2008), DBE (2014). The policy makers, educators and all stakeholders involved are striving to find a lasting solution to this societal menace. Therefore, there have been many studies and debates surrounding the issue of poor performance of learners in mathematics; it is quite disheartening that most of the studies have been on secondary schools to the detriment of the bedrock of education which is the foundation phase. Mathematical games are 'activities' which involve a mathematical challenge, are governed by a set of rules and have a clear underlying structure, normally have a distinct finishing point and have specific mathematical cognitive objectives (Way, 2013).

Undoubtedly, research interest on educational games is continuously growing; however, the integration of games in teaching is still somewhat an unexplored area of study, many teachers are not willing to do it, which is one of the reasons why it has received limited attention in the research field (Girard, Ecalle & Magnant, 2013; Tzuo, Ling, Yang, & Chen, 2012). Hanghøj & Brund (2011) argue that research on games in education has mostly sought to either

measure the learning outcomes of game-based learning or to ‘identify the inherent learning potential of particular game designs’.

Despite the contributions of many educational studies showing that the teachers’ role is crucial in the creation of game-based learning environments for curriculum-based education (Hanghøj, 2013; Hanghøj & Brund, 2011; Kangas, 2010), the teacher’s pedagogical activities and the roles are not widely elaborated. Based on their empirical analysis of teachers’ game-based practices. Hanghøj and Brund (2011) describe four teachers’ roles when teachers facilitate games for educational purposes: instructor, playmaker, guide, and evaluator.

Teachers are also required to perform as evaluators in the game-based learning environment in order to understand, explore, and provide dialogical response to the students’ experiences of gameplay. Connolly, Boyle, MacArthur, Hainey & Boyle (2012), Hanghøj (2013) conducted a systematic literature review about potential positive impacts of gaming, especially paying attention to learning, skill enhancement, and engagement. Girard *et al.* (2013) reviewed the experimental studies designed to examine the effectiveness of video games and serious games on players’ learning and motivation. They pointed out the difficulties in drawing conclusions about the effectiveness of games because the nature of the studies varied significantly, and only nine studies in their literature review met the predefined inclusion criteria. As previous literature reviews indicate, the teachers’ pedagogical role has not yet been covered by earlier literature reviews. Thus, on the basis of recent literature reviews, debates have not shown a clear understanding of the teachers’ role when using educational games in education.

Therefore, the purpose of this review is located within this context because it is motivated by a concern about the current abilities of primary teachers to make choices, establish their perceived needs, as well as optimally use the learning materials available to explore the research field from this point of view and to investigate the teachers’ pedagogical activities in game-based learning research settings.

Purpose of the study

The purpose of this literature review is on gaining an insight into the teachers’ pedagogical activities in game-based learning.

Literature Review

Concept of Games

It is not an easy task providing linguistic definitions of games, because the word game means different things to different people, they can be interpreted in many different ways. The word ‘game’ is associated with ‘play’. It has a ‘non-serious’ connotation. For example, we sometimes say ‘It’s only a game’ – deducing that it (the game, or what happens during play) is not important. This causes a problem for people because school is thought to be about

'work', not 'play'! Games are closely associated with human desire for fun, which could suggest that there is an instinct 'to play' this trace of fun as an innate personality trait continues from childhood to adulthood. As a matter of fact, play is an integral part of life and culture. There is such a variety of activities considered to be games, causing the definition to be quite complex. Ricciardi and De Paolis (2014:2) describe a game as "an activity among two or more independent decision-makers seeking to achieve their objectives in some limiting context" (Abt, 1970:6). Michael and Chen (2006) defined 'games' as a voluntary activity, separate from the real life, creating an imaginary or immersive world. Games are played out within a specific time and place, according to established rules and create social groups out of the players. The game can be seen as a set of restrictions (rules) of a voluntary nature because they are accepted by players, which thereby establishes a stable order. Mathematical games are 'activities' which involve a mathematical challenge governed by a set of rules and have a clear underlying structure, normally have a distinct finishing point and have specific mathematical cognitive objectives Way (2013) and that games are often used in classrooms as teaser activities, as time-fillers or as a reward for finishing work.

Critically, students must be active rather than passive and this may not happen with a didactic teaching model (Guzman, Astrom, Dormido, Hagglund & Piguet 2006). A sense of fun helps with recall and games can also give immediate feedback on current understanding (Pickford & Clothier 2006). Thus, the need for the integration of games in mathematics pedagogy becomes very important.

The Role of Games in Teaching Mathematics

There have been many debates on the roles of games in teaching Mathematics. McLester (2005) states that "Nearly seventy percent of students learn best actively and visually" and because of this, she feels that there are many potential benefits of active learning through games in the classroom. Van Eck (2006) mentions that in the last 40 years many studies have discovered that games promote learning and decrease the time of teaching for a large number of subjects and with pupils of different age. In his research Burguillo (2010) observes that a combination of game playing and friendly competition resulted in pupils' strong motivation and helped increase learning effectiveness. Furthermore, the research by Yang and Chen (2010) determine that spatial skills were significantly improved after playing a digital mathematical computer game (pentomino).

According to Ke and Grabowski (2007) playing computer games influenced motivation, attitudes and learning mathematics in grade 5 of primary school. It was carried out on a sample of 125 pupils divided into cooperative groups who were competing. The pupils took a mathematical test before and after the experiment. The research results show that playing computer games was more efficient than doing traditional mathematical tasks. Games improved pupils' test results, motivated them and created a positive attitude toward mathematics regardless of their individual differences (Çankaya & Karamete 2009).

Short games, particularly those played with cards and dice, are very accessible to younger learners and can aid in the development of core number skills, mental agility and fluency in number (Way, 2013). In an informative series of articles entitled “Learning Mathematics through Games Series” on the University of Cambridge NRIC website, lists numerous benefits to learning through games such as motivation, developing positive attitudes towards maths and allowing children to operate at different levels of thinking as well as providing opportunities to learn from one another. According to Way (2013), games taught and used in the classroom can potentially also be played at home and shared with family members, thereby allowing learners to spend more time on maths, to consolidate skills and practice what they have learnt in class, to teach other people the rules and to get other people involved in mathematics. It is important to remember that games are supplement teaching tools and teachers ultimately need to be actively involved for them to be truly effective.

Teachers’ pedagogical Activities in Game based Learning:

Pedagogical considerations of the teacher’s activities as well as actual practices and processes of teaching before, during, and after the game play are as important as learning outcomes of game based learning and the identification of the inherent learning potential of particular game designs (Hanghøj & Brund, 2011; Tzuo, Ling, Yang & Chen, 2012).

According to Kangas (2010) teachers’ role in the learning phases is determined by the learning goals and the game based learning environment. But some studies have shown that despite the fact that teacher’s role is crucial in the creation of game based learning environments for curriculum- based education, yet the teacher’s pedagogical activities and the roles are not given a befitting attention. (Hanghøj, 2013; Sadler, Heiselt, Hickey, & Zuiker, 2010). Hanghøj and Brund (2011) state that four teachers’ roles when facilitating games for educational purposes includes, instructor, play maker, guide, and evaluator. Hanghøj (2013) explains that the role of instructor refers to the teachers’ planning and communication activities that relate to learning goals. The playmaker role denotes the teachers’ ability to communicate the tasks, roles, goals and dynamics of the game at hand. The role of the guide refers to supporting or scaffolding students in their learning during the gameplay. Teachers are also required to perform as evaluators in the game-based learning environment in order to understand, explore, and provide dialogical response to the students’ experiences of gameplay.

However, Watson et al. (2011) Kangas (2010) explain that the role of the teacher appears central, not only in connecting the game-based learning to curriculum, but also in translating between the game world and the real world and assessing the game-based learning processes and outcomes. Furthermore, Kangas (2010) describe that, in using games in the classroom, the teacher creates a framework for learning, for introducing the goals and the tools, for leading the students to the topic, for participating actively in the learning situation, and for organizing the gaming process and reflecting on content knowledge learned after the game (Kangas, 2010). Barab, Sadler, Heiselt, Hickey and Zuiker (2010), point out that it is also highly important that the teacher defines what content knowledge students are expected to

learn in the game and discuss the chosen content outside the game using more traditional instruction methods.

Therefore, the teacher makes it possible to look at the content from different points of view and to create links between the game and the content knowledge within the curriculum. Teacher's pedagogical activities became evident in various game-based learning processes: in planning, in orientation, during the gaming and after the gameplay sessions. In orientation, the teacher leads students to the actual topics and introduces the game, the gaming process and the pedagogical aims the game seeks to reach (Chee & Tan 2012). In orientation, knowledge is shared. The teacher starts the gaming session with an introduction and provides background information on the purposes of gaming (Barab et al., 2007, 2010).

During the gameplay, the teacher is an active tutor, guide, supports and scaffolds students in their learning during the gameplay. For example, by asking relevant questions, the teacher guides students' discussion during the game and directs students to see the most important matters for learning (Chee & Tan, 2012; Watson *et al.* 2011). In the research of Watson *et al.* (2011); Barab et al. (2010); Wang and Hung (2010), the teacher's specific questions during the game aimed at focusing the students' attention on the concepts they were to learn by playing the game. The findings suggest that, depending on the learning goals and the game context, the teacher's role varies from a leader to a facilitator and from an organizer and planner of pedagogical entities to a guide and a tutor during the gameplay sessions. Arnab, Brown, Clarke, Dunwell, Lim, Suttie and De Freitas (2013) explains that the teachers' active role as a facilitator during the gameplay appeared when answering the students' questions and asking follow-up questions. In some cases, the teachers stopped the game to discuss game-related content matters. In the research of Arnab *et al.* (2013) the teacher stopped the gaming for a while gathered students to talk about the themes of the game.

According to Kangas *et al* (2010), the teacher also has a significant role after the gameplay session. This is visible, for example, when the teacher discusses the game content after the gaming situations and in this way connects the learning experiences gained in the games with the curriculum and learning. In some studies Chee and Tan, (2012), Barab *et.al* (2007), explain that pedagogical activities after the gameplay were called debriefing, furthermore, activities after the game included writing essays Barab *et.al* (2010) or holding a joint discussion on game-related topics (Arnab *et.al.*, 2013). According to Barab *et.al* (2007), discussions after the gameplay might clarify many misinterpretations and ultimately lead to a more well-grounded interpretation of the problem among the students. In agreement to the above statement, Kangas (2010b) referred to elaboration as the learning processes after gaming that elaboration refers to reflection on and the evaluation of activities. Watson *et.al* (2011) explains that even if the games themselves are well designed, the teacher's active role is important when integrating learning games into teaching. The teacher was also seen as an agent that bridges the game world and the real world (Watson *et al;* 2011). About the teacher's pedagogical activities therefore, we can say that the teacher creates a pedagogical

frame for game-based learning, leads the students to the topic, tutors the learning processes, and organizes possibilities for reflecting on the gaming process and content knowledge learned during and after the game.

Factors that Prevent Teachers from Using Educational Games in Teaching

Despite the contributions of researchers to the usefulness of games as a tool in education and are encouraging it to be used in the future, large numbers of teachers still maintain a reserved attitude towards the adoption of games for instruction. A number of early studies investigated why teachers do not use educational games in their teaching (Shaffer 2006 & Egenfeldt-Nielsen, 2005). Not surprisingly found a list of inhibitors among others, four factors have been found to hinder teachers' use of games in the classroom: challenges of implementing games effectively, challenges with using technology, current educational system, and challenges with obtaining games.

In a study, Koh, Kin, Wadhwa & Lim (2011) found that teachers in Singapore thought games can only be used occasionally. The perception was influenced by external factors such as policies and curriculum, and internal factors such as personal interest and attitude towards gaming. Some preservice teachers in Turkey expressed doubts concerning classroom management and educational effectiveness of the computer games on the present Turkish market (Can & Cagiltay, 2006). The European teachers were not sure about the positive effects of playing games on students' critical skills and performance in the specific subject matter being taught (Wastiau, Kearney, & Van den Berghe, 2009). Some teachers even considered games a distraction to students (Pastore & Falvo, 2010). The negative views pose barriers to the adoption of games in classrooms and also imply the inadequacy of current research concerning DGBL.

Teachers' perceptions of using games for education may also be influenced by limited experience with video games and perceptions such as those of students, parents, other teachers, and experts (Bourgonjon, Valcke, Soetaert & Schellens 2010). A number of studies suggest that the current educational framework is a huge barrier to the adoption of games in education (Koh *et al.*, 2011; Wastiau *et al.*, 2009 & Baek, 2008). In Koh *et.al* (2011) the Singapore teachers highlighted that although the Ministry of Education supported the use of games in education, no specific policies regarding game adoption was made which led to lack of instructional game materials, inadequate training for teachers and inadequate administrative support for innovation.

Other frequently mentioned barriers concerning schools include inflexible curriculum, limited budgets, and lack of adequate hardware resources (Koh *et. al* 2011; Baek, 2008). Teachers consider games' weak alignment with curriculum and state standards as a huge barrier (Koh *et. al* 2011; Wastiau *et. al*, 2009). The other barriers arising from games and using games include inaccurate or inappropriate game content, lack of supporting materials, negative effects of gaming, high cost, licensing and technical issues, limited affordances (Wastiau *et al*

2009; Baek, 2008). Therefore, in order to succeed in the intergration of games in mathematics pedagogy the barriers must be taken care off.

Conclusion

This study provides insight into teachers' pedagogical activities in relation to educational games. It reviewed the practising teachers' use of educational games as pedagogical tools in the teaching and learning of Mathematics at the foundation phase. In the concepts of games, it was indicated that the role of game in the teaching of Mathematics, teacher's pedagogical activities together with the role of the teacher in game-based learning are vital in various game-based learning processes. As highlighted in the review, it suggests that teachers' roles about teaching and learning with games are central to integration and this calls for further development of pedagogical models. Furthermore, it is suggested that successful integration needs to address three interlocking frameworks for change: the teacher, the school and policy makers based on the notion that the perception or the orientation of the teacher including the skill, the vision of the school and the policy document perspectives on the issue are vital to intergration.

Hopefully, future research will offer more information and provide directions for developing game-based learning. In order to understand how and why games should be integrated into teaching and the curriculum framework, examining the teachers' pedagogical activities in games-based leaning.

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