CONFERENCE PROCEEDINGS

Editors: Dr UG Singh (University of KwaZulu-Natal, South Africa)

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Table of Contents

Message from the Conference Chair

Research in essence is essential in building the knowledge base in all areas of sciences, both applied and social sciences. This conference proceeding is the compilation of research for the inaugural conference which took place on 3 - 4 December 2020 completely in a digital environment with the base of the conference in Durban, South Africa. digiTAL 2020, the International Conference on Teaching, Assessment and Learning in the Digital Age brought together research that focused on unpacking current practices in the higher education sector as well the systematic consideration of the quality, effectiveness and practices in the digital age.

It was without doubt a forum where academics across 14 countries met and interacted in the various areas of research which included responses to COVID-19 in higher education, applications in the digital sphere for teaching and learning, discussed potential of MOOCs and micro credentials for student access, awareness and perception of open access resources, student engagement in the digital environment, cultural influences, digital environment in the secondary schools and subject specific digital teaching and learning research.

This Conference proceedings is the culmination of the presentations that were accepted for this inaugural conference. This publication of 47 papers showcases the richness of research that takes place internationally within the walls of the ivory towers of the higher education sector.

This 1st edition of digiTAL2020 proceedings was scientifically rewarding and a pleasurable experience for the organizers and community of participants. The research without adds to the body of knowledge where practitioners in the higher education and secondary school system would be to access and build upon and possibly report in the next iteration of this conference scheduled in 2021 in Durban, South Africa.

Finally our thanks go out to our collaborators of this conference, the Victorian Institution of Technology, Australia, and the e-Assessment Association, UK.

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Personalised Learning for the Learning Person

Rupert Ward, University of Huddersfield, UK

Keynote Abstract

Personalised Learning has developed very little since it was first proposed as an educational evolution two decades ago. We are now at the point where educational policy, processes and technology have evolved to enable us to finally realise its benefits. This talk discusses the fundamental principles of Personalised Learning, comparing them to our traditional education model. Our traditional educational model has evolved very little in the past two hundred years and has significant systemic issues which are increasingly at odds with the needs of our modern global knowledge economies. By understanding what these issues are, and how they can be addressed through Personalised Learning, the speaker seeks to demonstrate why it is time now not for an educational evolution, but rather for an educational revolution through Personalised Learning for the Learning Person.

Microlearning in the Digital Age: The Design and Delivery of Learning in Snippets

Badrul Khan, USA

Keynote Abstract

Microlearning can be viewed as a single objective-focused, outcome- based, stand- alone, meaningful, and interactive learning unit delivered in bite-sized snippets (i.e., a short modular format) either digitally (i.e., via computer, tablet, or mobile phone) or non-digitally (i.e., as via a flashcard or booklet). Designing and delivering microlearning requires thoughtful analysis and investigation of how to use the learning media's potential in concert with instructional design principles and issues critical to various dimensions of the learning environment. In this keynote presentation, microlearning will be discussed from the perspective of a comprehensive framework encompassing the eight critical learning issues of learning including: pedagogical, technological, interface design, evaluation, management, resource support, ethical considerations and institutional. Attributes and Characteristics of microlearning will be discussed. Examples of microlearning in practice will also be demonstrated.

21st Century Education – It's Time To ACT

Craig Blewett, University of KwaZulu-Natal, South Africa

Keynote Abstract

Critical thinking, metacognition, creativity, and problem solving are a few of the much-touted 21st century skills we need to develop in our students. However, technology, which continues to be seen as the solution to declining attention spans, is neither improving results or addressing these missing 21st century skills. Numerous studies report that technology in the classroom is actually decreasing recall and attention. However, despite this, billions of dollars are continuing to be invested every year into attempting to redesign modern education.

While it is clear that technology is key to our 21st century lives, what is not clear is how it should be used to improve teaching and learning. Two key issues need to be addressed as we rethink modern education. The first is shifting perceptions of teaching and learning from an efficiency-driven mindset towards an effective-driven mindset. The second is the identification of appropriate digital-age pedagogies to support modern teaching.

Efficiency driven teaching has grown out of an industrial-age paradigm that sought to standardize and batch process as many students through the system as possible. While these agendas continue to exist, there is a rising need for a move towards an effective approach that seeks to maximize learning through proven active learning approaches.

However, in order to develop effective active learning, it is necessary to develop an appropriate set of digital-age pedagogies. It is also imperative that the pedagogies harness the affordances of technology while also aligning with how modern students engage with technology. To this end a study was conducted that sought to determine how students learn in modern online spaces. Arising from this study, and subsequent work with schools and universities, was the development of the Activated Classroom Teaching (ACT) model. The ACT model is a taxonomy of teaching and learning pedagogies that encourage active learning while also attempting to develop key 21st century skills. This presentation creatively explores how the ACT approach can positively impact modern education.

Ditching the paper, treasury tags and rubber bands - Benefits and Barriers to e-assessment (CBT)

Teresa Jacobs, Executive Director of International Skills Development Corporation, UK

Keynote Abstract

Ditching the paper, treasury tags and rubber bands - Benefits and Barriers to e-assessment (CBT)

Every day of the year, across the globe and especially at the end of the academic year, several million students sit examinations.
They make to the journey to the test centre, endure the wobbly desk and plastic chair, bringing their pencil case full of erasers and pencil sharpeners, the ticking clock and the indignity of raising their hand if they want an extra answer book or worst still, a trip to the bathroom.

When the exam those super tech savvy students begin to frantically scribble answers onto paper booklets. The peace is only disturbed by the ticking clock and the grinding of exam candidates anxiously sharpening pencils or shuffling papers.
Thus tens of thousands of scribbled paper scripts are produced by students now suffering from aching hands. These scripts are bound with treasury tags and elastic banks into big plastic bags...... and flown across the globe for marking. Ultimately, when the results are released to gather dust in storage.

Why all the discomfort? CBT technology has been around and improving since the 1990s.
Why are educational institutes and regulatory stakeholders so reluctant to adopt CBT? Why in a world where hand-writing is reserved for the odd shopping list or memo, do we insist on making our students hand write their exams?

This interactive session explores the many benefits of CBT, including security, mark standardisation, results release and convenience, environmental impact and convenience for both exam takers and markers. The session will explore some of the current barriers to CBT adoption and highlight the latest in technology.
The presenter has first-hand experience of rapid and extremely positive transformation from paper to CBT and will share the perceived advantages and point out some of the pitfalls.

Professionalising Academic Writing

Sid Nair, Victorian Institute of Technology, Australia
Dr Violet Makuku (Quality Assurance Specialist, Project Manager-HAQAA Initiative & Workshops Coordinator), Association of African Universities, Ghana

Workshop Abstract

Developing academic writing skills is one of the key components that needs to be taken care of to enhance chances of research articles to be accepted for publication, theses/dissertations to be passed by examiners and winning of research and project grants, globally, among other things. Therefore, these skills are extremely important to students, researchers and faculty. The key components to be considered and taken care of seriously include, and not limited to the purpose, language, tone, clarity, citation, provision of evidence, fairness, logical arguments and relevance of the aspect(s) under consideration. Perfecting academic writing skills can help Higher and Tertiary Education Institutions (HTEIs) to develop from being teaching to research institutions. It is against this background that individual scholars and the institutions they work for, should come together and invest adequate time, skilled manpower and financial resources in capacity building and staff development in this important aspect. Institutions could use both internal and external facilitators to assist in the training of students and staff. Mentoring, coaching and induction should also be part of the improvement plan because most young scholars lack the academic writing skills and experience while the elderly professors also need re-tooling to catch up with the related current trends and contemporary issues in this vital component of research and scholarly work.

Key words: Quality Assurance, Academic writing skills, Higher and Tertiary Education, Capacity Building

E-Assessments – A Comparison of the grades of self-regulated versus non-self-regulated learners in an L2 module

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Abstract

Institutions of higher education, globally, face challenges of increased enrolment and disproportionate staff-student ratios. On the flip side web-based teaching and learning resources are available. This paper reports on Basic isiZulu, a second language (L2) module at the University of KwaZulu-Natal in South Africa. This compulsory module was introduced to promote social cohesion and enable L2 speakers to communicate in wider society. It is axiomatic that a key objective of the module is promoting learner autonomy in terms of language use. Little (2007) aptly visualises autonomy in language use and autonomy in language learning as two sides of the same coin. Focussing on the construct of autonomy in language learning, this paper explores the link between self-regulation and performance. Informed by the concept of Emergent Self-Regulated Learning (Oates, 2019), this quantitative study details student engagement with online formative assessments, tracking the performance of learners from formative to summative e-assessments to final written/pen and paper assessment. The study makes a distinction between self-regulated and non-self-regulated students, and the aim is to determine if participation in formative assessment has a measurable impact on performance of these two groups. The hypothesis is that students who practice self-regulation by engaging in the formative assessments, achieve a higher overall grade , making them potential autonomous learners.

Keywords : Self-Regulated Learning, Second Language (L2) Teaching, Formative Assessment, Summative Assessment, Autonomous Learners

Negotiating the possibilities digital humanities offers Media and Cultural Studies for crisis curriculum adjustments in the time of COVID-19

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Abstract

In this article, we reflect on teaching opportunities and limitations emerging as a result of the COVID-19 lockdown. Media and Cultural Studies (MECS) curriculum in South Africa traditionally focussed on critical or vocational discourses, or a mix between the two (Tomaselli and Caldwell 2002, Jordaan 2004, Boschoff and Garman 2016). Vocational training depends on contact as students do not have access to specialised equipment outside the university space. In extraordinary times as the COVID-19 lockdown, theoretical portions of MECS curriculum may be repurposed to migrate to online platforms like Moodle, Loom and Zoom. Media educators are confronted with the question of how to meaningfully replace contact vocational education, in this case Video Production.

Digital Humanities (DH) is explored as a gateway for advancing vocational education without compromising critical thinking. Digital humanities refers to the branch of scholarship using literary and linguistic computing (Terras, Nyhan and Vanhoutte 2013, 2), making 'creative use of digital technology to advance humanities research and teaching' (Gold 2012, ix). Tools for collaborative writing, data visualisation and text mining will be elaborated as the means of developing digital literacy. Digital literacy refers to using technology to one's own benefit in order to actively and productively engage in the world, a 4IR world, which some argue is already upon us (Hamid, 2018).

Digital storytelling is an important approach to visibility and empathic listening (Benmayor 2012, 524). Scholars focusing on narratives (Bourdieu 2000; Ellis 2004; Lather 2017) demonstrate the power these stories have to reveal the structure of class, race, gender and sexual orientation. In our context, a focus on digital storytelling could serve as an important intervention addressing the historical invisibility of most communities. This is one way of getting students to become confident with technology to become digital producers in their own right.

Keywords: Digital Humanities, Decoloniality, Digital Literacy And E-skilling, Digital Storytelling, Stereotyping

Emergency remote education during COVID-19 lockdown: an analysis of the effectiveness of online collaborative learning to foster skills development in a foreign language pedagogy course focusing on CLIL

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Abstract

The present study aims to analyze students' perceptions of the effectiveness of online collaborative learning, implemented as part of emergency remote teaching (Hodges, Moore, Lockee, Trust, and Bond 2020) in a foreign language pedagogy course focusing on CLIL (Content and Language Integrated learning) delivered at an Italian university during the pandemic, to foster the development of students' CLIL-related professional skills through digitally-driven practices. Shortly after its beginning, the course moved online overnight due to the COVID-19 national lockdown, which entailed the redesign of some course components including assessment within a socio-constructivist framework characterized by highly interactive and discovery-based learning as well as co-construction of knowledge (Selwyn 2016; Hampel 2019). The course was re engineered using the Community of Inquiry model, which is based on social, cognitive, and teaching presence and which values students' engagement with content, peers, and instructors (Garrison, Anderson, and Archer 2000; Garrison and Arbaugh 2007; Vaughan, Cleveland-Innes, and Garrison 2013). Hardly any literature has been produced so far on students' perceptions of the effectiveness of online collaborative learning to enhance the development of learners' CLIL-related professional skills through digitally-driven practices implemented as emergency remote education, which makes the topic cutting-edge and important to investigate in the aftermath of the COVID-19 crisis. An online semi-structured questionnaire, submitted to learners at the end of the course, was used to collect data for the study. Findings show that most students highly appreciated online collaborative learning, which they found especially instrumental in fostering the development of CLIL-related professional skills; further interesting pedagogical reflections including challenges and opportunities of emergency remote teaching have emerged from the data analyzed. The emergency remote education implemented during the pandemic is likely to affect post-COVID educational practices extensively worldwide (Selwyn 2020; Macgilchrist 2020); in this perspective, the study provides useful and timely information to higher education institutions that need to design similar blended and/or fully online courses effectively in the future.

Keywords: CLIL, Emergency Teaching, Digitally-enhanced Learning

Moving beyond the traditional classroom: an isiZulu online language curriculum

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Abstract

Although the COVID-19 pandemic has forced institutions worldwide to embrace online teaching, it has also created an opportunity to explore teaching languages online. Teaching second or foreign languages in an online environment, either synchronously or asynchronously, is not a new phenomenon. However, the effectiveness of teaching languages online is heavily debated because of the inherent in-class interaction for communication. Research studies indicate that success in the adoption of online courses within tertiary language education curricula lies not only on the chosen technology but also in the careful and systematic design and implementation based on second language principles. Language learning online courses are uncommon in the teaching and learning of African languages within a tertiary context. The adoption of an online isiZulu course could provide opportunities for non-traditional face-to-face students as well as offer practical options to suspending lectures during unforeseen circumstances. This study explores the use of technology-mediated communication isiZulu tasks in doctor-patient task-based syllabus design by adopting González-Lloret and Ortega's technology-mediated task-based language teaching framework (2016). The rationale for adopting a technology-mediated TBLT framework is to improve isiZulu communicative skills during the pre-clinical years and to sustain the continuity of autonomous isiZulu language learning in the clinical years.

Keywords: Online Teaching, Isizulu Second Language, Technology-mediated Tasks, Task-based Syllabus Design, Doctor-patient Tasks, Communicative Skills, Autonomous Learning

Transitioning to Emergency Online Learning (EOL) during the COVID-19 lockdown: Attitudes of Postgraduate students in a Business School in South Africa

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Abstract

The global pandemic, COVID-19, has impacted the world in multiple profound ways. Many countries, including South Africa, have implemented lockdown measures, which have resulted in citizens having to "stay at home". This has had a severe impact on education, especially for Higher Educational Institutions in South Africa, which resulted in learners suddenly having to depart their institutions of learning. The advent of Emergency Online learning (EOL) is now considered the best way to deal with teaching and learning, given the urgency around saving the academic program. This research examined the attitudes of adult learners in a Business School in South Africa who had to suddenly transition from traditional face-to-face to EOL, in the midst of the global COVID-19 pandemic. The study is largely quantitative in nature but incorporates open-ended questions to allow qualitative data to be collected to understand the perceptions of students and to further probe responses. An online questionnaire designed to suit the study objectives was developed, and made available on SurveyMonkey for all coursework Postgraduate Diploma and Master's students in a Business School in South Africa to complete. Data were analysed using the Statistical Package for the Social Sciences (SPSS) v.26. The level of support from the Business School and lecturers, having a private space to study and technological competence were the most significant predictors of ease and success of transitioning to EOL and these lead to a positive experience. It is important that the learners and staff alike receive continued support and training to enable technological competence, and that all stakeholders are able to be adaptable, and willing to embrace change, specifically in the midst of a crisis. The research adds to a growing body of scholarship on the attitudes of learners transitioning to EOL and also contributes towards understanding transitioning to effective planned online learning.

Keywords: Emergency Online Learning (EOL), COVID-19, Postgraduate students, Adult learners, Business School, South Africa

The COVID-19 effect on Mauritian Higher Education

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Abstract

The outbreak of the COVID-19 pandemic was unexpected and has utterly revolutionised the education system. More fundamentally, COVID-19 is causing all Higher Education Institutions (HEIs) to challenge the deep-rooted conception of how, when and where to deliver education and proving how yesterday's disruptors can become today's lifeguards. While many traditional or campus-based institutions once viewed online education as a threat, valueless and sceptical, poor quality (Ghandforoush, 2013), it has yet come to their rescue. The impact has been transformative and dramatic as academics are forced to find workable, fast and effective solutions for online movement, remote teaching, and lifelong learning using digital platforms and at the same time, maintaining the same depth of engagement with students they could have in a classroom setting. The rising popularity of online education has resulted in educational institutions in an extraordinary potential opportunity of cost savings in the long-run and ease of scaling fuels ongoing investments in online education by all HEIs. During the pandemic, the online movement has made academics more adept at handling the technology and valuable devices of the digital age for lifelong learning and help students with more tasks in virtual learning. This study aims at investigating how academic staff at Mauritian HEIs are coping in times of the COVID-19 pandemic. The data was collected through the distribution of an online questionnaire at 5 HEIs with informed consent and ethical clearance. Preliminary results indicate that 85.7% of respondents adopted the contact-based mode, and 80% moved to the online mode and 57,1% assume they will move to blended learning. The most popular tools adopted during COVID-19 by these academics to support their online learning are Zoom (66.7%) and Google Tools (52.4%). Email and WhatsApp were the tools most popularly adopted for communication with students, during the pandemic. While there were no significant results in respect to challenges faced with working from home, the sudden shift caused a level of anxiety and stress for respondents.

Keywords: Online education, Digital Learning, Higher Education, Academic Perceptions, Transition, Mauritius

Improvements to the learning and assessment of Process Dynamics and Control concepts for fourth year chemical engineering students

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Abstract

In this work the learning and assessment of the practical component of the Process Dynamics and Control fourth year Chemical Engineering course at the University of KwaZulu-Natal was improved and consequently, the general performance in selected aspects of the course. The previous methods employed for the practical assessment of the course were based on out-dated experiments and software that students found difficulty working with and which are losing relevance in industry. New simulation-based practical experiments using ASPEN Plus® and ASPEN Dynamics® were developed and students were required to configure, commission and optimize advanced industrial process control schemes. Feedback from students and the instructor was documented and is reported. An increase in the general understanding of the module content for the aspects assessed in the new practical was observed, as quantified by an increase in the pass rate and average mark of the cohort regarding the selected aspects specifically, in comparison to previous years.

Keywords: Process Dynamics and Control learning, Assessment, Chemical Engineering

Assessing the Effectiveness of ICT Tools and Proposed guidelines in teaching and learning at public primary schools around Mafikeng, North West

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In the digital age, information and communication technology (ICT) is increasingly used to support teaching and learning as part of technology mediated learning such as, mobile learning and digital learning. There is growing evidence that the use of ICT tools in teaching and learning enhances student learning and produces ICT savvy learners who may readily participate in the fourth industrial revolution. During the Corona virus pandemic a paradigm shift was required from a physical platform of learning to a more online arrangement. Schools which had integrated ICT tools in teaching and learning were able to keep progress with the academic year. Thus highlighting the value of technology integration for the effective use of ICT tools in teaching and learning even during crisis situations. The purpose of this study was to investigate the factors that enhance the effective use of ICT tools in public primary schools in Mafikeng, South Africa. Data was collected using both quantitative and qualitative approaches. The collected data was analyzed using confirmatory factor analysis and thematic coding. Findings indicated that the effective use of ICT in teaching and learning is affected by many factors that include: Lack of ICT relevant skills, lack of adequate infrastructure, ICT support, electricity, connectivity, inefficiency, poor attitude and teacher non-compliance with what amongst others. In conclusion the study recommends a framework for effective use of ICT tools in teaching and learning. Furthermore, the study advocates for the alignment of ICT policy at all levels of governance.

Keywords: Digital Age, ICT Tools, Teaching And Learning, Public Primary Schools, Guidelines, Framework

Consolidating Didactic Pedagogies in Mathematics Education in the Era of COVID19 Pandemic: New Teaching Experiences, Pedagogy and Practice in Ghana

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Abstract

The COVID19 pandemic compelled the education world to explore and redesign varied methodologies but didactics was under-estimated. However, didactics has been proven to be a viable online tool in this era of COVID19 where most of the instruction takes place online. The study therefore compared the learning outcomes of face-to-face classroom and online didactics pedagogies for second-year mathematics students in the Department of Basic Education, University of Education, Winneba, Ghana who were out of the campus. We used the quasi-experimental design. In this design, we first assessed all the students through the face-to-face methods. We then followed up with the direct didactics online LMS covering the same mathematics topics of the semester and subsequently assessed the students. The test items of the face-to-face (pretest) and the scores of the online didactics LMS (post-test) were written by the researchers and validated with a different group of lecturers and students. Having attained the Cronbach alpha coefficient of more than .70, the mean scores were analyzed using the paired t-test. In addition, the attitudes of students were assessed using a 5-point attitudinal scale. This scale provides a quantitative measurement of attitudes, opinions or values by summarising numerical scores given by researchers to people's responses to sets of statements exploring dimensions of the underlying themes. Thirty-six out of fifty students successfully completed the tasks through the online model. The results of the mean gain scores showed that students acquired more knowledge from the didactic pedagogies than the face-to-face classroom instruction (didactic: 24.32% ± 16.06; face-to-face: 8.13% ± 13.21). The mean difference between didactic pedagogies and face-to-face was 14.43% with 95% confidence interval [p = 0.001. The attitudinal scale revealed that 70% of the students believed the didactic pedagogies did impact on their performance and 85% of the students attested that they really enjoyed the didactic methods. Just 56% of the students preferred the didactic pedagogies and will continue to learn mathematics via didactics even if we resume face-to-face classroom instruction. We concluded that didactic pedagogies were not equivalent to face-to-face instruction. It was also concluded that didactic pedagogies are valuable and effective through the online LMS. We therefore recommended that online didactics should be inculcated into new mathematics teaching experiences, pedagogy and practice in this era.

Keywords: COVID-19 Pandemic, LMS, New Teaching Experiences, Online Didactics, Pedagogy and Practice

Cultural Influence on Educational Technology Acceptance

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Abstract

The outbreak of COVID-19 resulted in schools shut down across the globe. This led to a dramatic change in teaching and learning as most teaching and learning took place remotely and on digital platforms and hence indicative of a possible rise in the use of educational technologies. Before the outbreak of COVID-19, educational technologies growth and adoption was already on the rise as global educational technology investments for 2019 was US$18.66 billion and the projected overall educational technology market for 2025, is said to possibly reach $350 Billion. Among the many educational technologies that saw rising use during the COVID-19 period include language apps, virtual tutoring, video conferencing tools and online learning software. With the increase in COVID-19 cases and the inter/national governments lockdown restrictions across the globe that practically made it impossible to have face to face classes, there has been a sudden shift from to online mode of teaching and learning. Considering that the sudden shift was necessitated by the COVID-19, the question of a sustained rise in the adoption of online learning at its current level, post COVID-19, remains unanswered. To answer this question, this study seeks to examine the influence of culture on educational technology acceptance. Particularly, the research will use the expanded Technological Acceptance Model in the Sub-Saharan African context to examine cultural influence on educational technology acceptance. The study will apply a mix method to conveniently collect data from 80 postgraduate students and 10 lecturers at the International University of Management in Namibia and after, analyse the data as such. The study is hopeful of establishing how the cultural characteristics of individualism/collectivism, power distance, uncertainty avoidance, long-term/short-term orientation and masculinity/femininity influence educational technology acceptance and hence how culture influences educational technology acceptance. Considering that data will be collected from one university and that only one technology (e-learning) will be employed representatively for technologies, the study foresees a challenge of generalising it's results beyond the context of this research: hence caution should be taken when generalising the results of the study.

Keywords: Culture, Technology, COVID-19, Sub-Saharan African, Educational Technology, Technology Acceptance

Co-creating Online Learning and Teaching for African Higher Education

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Interactive Workshop Abstract

This is an Open Space influenced workshop about improving online teaching and learning in African Higher Education as colleagues across the sector try to shift from emergency responses to sustainable systems and support for high quality online teaching and learning. The process will attempt to bring conference delegates together for peer driven discussions around areas of shared interest. Each group will prepare a short document with their major insights, good practices and recommendations for improvement. In accordance with Open Space principles participants will be able to move between conversations and to leave any conversation which no longer seems useful to them.

 Subject to participant interest and numbers questions could include:
- How do we design for resource constrained environments?
- How do we improve our capacity for online teaching?
- Which approaches to online course design work in African contexts?
- How can online facilitation be congruent with African cultures?
- Other questions suggested by participants

The workshop will make use of Zoom. Participants in a Zoom meeting can move freely between breakouts if they have the latest version of the Zoom software and the host has assigned participants the right to self-select their breakout room.

Keywords: Participatory Workshop, Mit Unhangout, Open Space, African Higher Education, Co-creating, Good Practices, Remote Teaching

What have we learnt from Emergency Remote Teaching in African Higher Education?

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Plenary Session Abstract

When the COVID-19 pandemic started African Higher Education Institutions were unevenly prepared for the suspension of face to face teaching. This resulted in a variety of responses including business as usual for some distance learning institutions, rushed preparation for the pivot online using an established learning management system, improvisation using systems like Whatsapp or Telegram or MS Teams, and in some cases acceptance that the institution was totally unequipped to support online learning. The panel will draw on online discussions and webinars in the e/merge Africa professional development network for educational technology researchers and practitioners in African higher education, a survey and interviews of e/merge Africa members, and the experience and insight of conference participants to consider the following questions:

1) What were the major obstacles faced?
2) What were the key lessons learnt?
3) Will the increased level of experience and capacity for online learning and teaching among students and educators result in a sustained focus on online learning even after the end of the pandemic?

Keywords: Emergency Remote Teaching, Online Teaching, Pivot Online, African Higher Education, Reflective Practice, e/Merge Africa

Critical Analysis Of Purposeful Integration Of Technology In Education - A Learner-centric Approach For Practical Applications

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Abstract

The inclusion of technology in education to enhance teaching and learning experiences continues to be an integral aspect of teacher education. With new emerging technologies, traditional teaching methods are bound to evolve. Various theoretical models towards informing teachers about appropriate technology integration and increasing teacher cognition on purposeful technology use in the classroom are available. However, there exists limited exposure of how to apply this in a practical context, for effective learning. This study demonstrates the use of conceptual framework and appropriate technology and methodologies to enhance the practical application for student-centred learning and teaching. A pilot study was conducted with students from various institutions to test variants such as access to technological tools that support curriculum goals, right technology competency, different approaches to teaching, remodelling of the classroom, and adoption of new methodologies as critical factors to enhance the learning process. These were tested against those who were deprived of all these parameters. Data collected from the survey was analysed, as well as from interviews and observations. The results indicated that students with access to the appropriate technological parameters had a higher learning ability, retaining capability and understanding of the subject in less time, compared to those who were deprived of such facility.

Moreover, to test whether successful integration of technology correlates with the acceptance of technology, a Technological, Pedagogical and Content Knowledge framework has been used. The findings showed positive intentions from both learning and teaching faculties. However, it was reported that students were more likely to use technology as a supporting and instructional tool during their studies rather than using technology to intensify student-centered learning or to support the curriculum. The results of the study helped to better exemplify approaches to integrating technology into the classrooms, as well as identifying parameters that would help in better technology inclusion for student-centred learning and for transformational change and reform.

Keywords: Technology, Integration, Critical success factors, curriculum, Pedagogical, Student-Centred, Framework

Introduction

Background of the study

Technology is the driving force of any economy. Today we rely much more on technology than we did previously. With the COVID pandemic, this reliance on technology is significantly greater. Integrating technology in education is all about creating instructional environments that can facilitate active participation, meet the specific and varying learning needs of students, and facilitate collaborative problem solving and critical thinking, thus providing students with an authentic learning environment.

There are numerous new and emerging technological tools that can assist teachers in making teaching much easier and engaging in daily classroom practices. This study provides an understanding on how firm integration of technology can be integrated into education, using the TPACK framework that demonstrates the relationship between Technology, Pedagogy, and Content. The framework provides the notional lens of how a teacher can develop technology-enhanced pedagogical content effectively ,as well as the type of competencies needed by a teacher for effective pedagogical delivery in a digitally enhanced learning environment (Lehiste, 2015; Lin et al. 2013; Angeli & Valanides 2005). Regarding this, Schmidt et al., (2009) stated that TPACK is a valuable tool that shows what skill teachers need to integrate technology into teaching, and how they might develop this skill.

The aim is for teachers to integrate the use of technological tools and pedagogical content in a unified manner so that it supports and extends curriculum objectives and engages students actively in meaningful learning (Mishra & Koehler, 2006; Mareco, 2017). Students should be able to use technology actively, not just view technology-based content provided to them by their teachers or lecturers in a passive way. Purposeful Integration can be achieved when technology is accessible and available readily.

The need for Technology Integration

Technology has been a medium for teaching since way back in the 1920s when films and radios were introduced into classrooms. It was only in the 1980s and 1990s that school reforms began utilising computers to assist in teaching students and to conceptualise learning (Cuban, 1993). The use of computers at that time was focused on facilitating lower-level cognitive skills (Flick & Bell, 2000), but advances in technology have proved to be effective in ensuring competency based cognitive skills, such as critical thinking skills (Jonassen, 2000).

Studies have suggested that online environments can be very beneficial and can help to improve reading engagement and critical thinking skills (Burgess, 2009). Moreover, in a research done by Morin, Thomas, and Saadé (2012), it was perceived that using the internet for research contributed the most in fostering critical thinking skills of students. Learning outside the four walls of the classroom has also been made possible due to technology. Today students are no longer limited to face-to-face interaction, since technological advancements have made it

possible for students to choose whether they want to attend class physically or via online medium, or both. Google classrooms, Zoom, and Microsoft teams, among others, are popular media that are used today for online learning and this has been working well for many institutions.

Education leaders have recognised the importance of students not only being technologically literate, but also being capable of adopting technology into teaching and learning. In many countries new technology standards have been included, that require teachers to integrate the use of technology into the curriculum for every subject, so that the technology skills and knowledge that students gain in the classroom will create a foundation not only to be proficient in technology skills and knowledge, but also to be prepared for the world of work where technology literacy is a must.

Rationale for Using Technology in Education

Technology provides motivation for students by gaining learners' attention, engaging the learner through production work and increasing perceptions of control. It offers unique instructional capabilities, such as linking learners to information and educational resources and tools, helping learners visualise problems and solutions, and tracking learners' progress. With technology, new instructional approaches, such as active cooperative learning, shared intelligence, problem-solving, and critical thinking skills, are supported.

Technology Integration in the Mauritian Education sector

The world today is ruled by the evolution of technology in all spheres. The Education sector, an important driver of the ecosystem, cannot be dissociated or disconnected from technology. In Mauritius much emphasis is laid on ICT in the education sector. Youth today are recognised as digital natives as they are in constant involvement with ICT, and they interact daily with technology in a totally different manner, and with a disconcerting efficiency. Hence it is important to ensure that all Mauritian youth, without any distinction, have access to technology, and acquire the necessary competencies to use technology effectively.

The ICT Strategy in Mauritius englobes four areas of concentration that focus on: Enhanced Teaching and Learning, Enhanced Teaching and Learning and Development of Pedagogical Content, Infrastructure and Connectivity, Education Management and Capacity-building and Professional Development.

In Lower Education

Primary subsector

For primary level, the EDLP (Early Digital Learning Programme) Project has been developed with the collaboration of the Mauritius Institute of Education (MIE), the Mahatma Gandhi Institute (MGI) and Educational Consultant India Limited. The programme aims at aligning the integration

of ICT into teaching and learning of pupils in the primary education sub sector using adapted tablets. These tablets consist of digital pedagogical contents including videos, e-books, interactive animations, hands-on activities, drawing, and creativity tools. Around 27,000 tablets were distributed in schools with 250 wifi projectors. A lot of work has been done in this sub sector for integrating technology with the provision of tablets to students, which brings also a change in curriculum to adapt to this integration.

Secondary subsector

In this category, students benefit from the Student Support Programme which is a web portal of free educational resources that can be accessed from multiple platforms. The objective is to implant a culture of autonomous learning among students at an early stage.

A pilot project of an Education Management Information System (EMIS) is under development that will include the creation of an e-Timetable Software and a Document Management System to ease the administration section of the education sector as well as of the academic staff.

In Higher Education

Tertiary Education Sector

For the Tertiary Education Sector, the implementation is laid on having an integrated Campus Management System. Some of the benefits of the system focus on an increased collaboration within and outside of the University and an efficient administrative set-up. Capacity-building and Professional Development is also being looked at and englobes the training of staff, including academics and administrative staff.

Integration of technology in Education in Mauritius started as a phased approach and is a learning curve with implementation being conducted on the four areas of focus.

Problem statement

With digitalisation, the use of technology has taken a different dimension. The way people reach out for information, do research, and communicate with each other around the world has changed dramatically. Today, for students to be employable they require technological competencies, as the world of work has changed drastically, from paper based to digital based systems. Therefore, technology integration must happen at an early stage in their education.

Nowadays, teaching is not bound to the four walls of the classroom. Numerous technological educational tools and platforms are available that can transform the way learning takes place. Technology itself is not the problem, they can be plug and play but how to integrate it with classroom instruction (Mishra, Koehler and Kereluik, 2009) is the real issue and the realm of this study. Teachers need to be aware of how to integrate the technological tools and pedagogical content together to be able to catch students' attention and interest and have them engaged

actively and this is where the TPACK model comes into play. If we want concrete change in the education paradigm, it is important to have teachers know how to incorporate all elements of the TPACK framework together for successful integration of technology in the education (Incikabi & Tokmak, 2013).

The purpose of this paper is to analyse critically the purposeful integration of technology in teaching and learning for a student-centred approach. The aim is to connect dispersed literature on various subjects in technology integration with empirical data (i.e. survey) and applying it to answer the research questions. To better investigate, the following questions have been identified to frame the synthesis of the literature review. Each question needs to be considered to understand fully the current field of the research.

1. How is technology currently being integrated into schools and what is the trend?
2. What is the adoption rate of technology integration by teachers and students?
3. What investments have been made to support educational technology and how have classes been remodelled?
4. How has technology impacted curriculum and pedagogy?
5. Do teachers have the right competency and skills for integrating technology into teaching?

Objectives of the Study

1. To determine the different approaches to successful integration of technology in classrooms.
2. To identify factors that can help in purposeful integration of technology in classrooms.
3. To determine the effectiveness of the TPACK (Technological, Pedagogical and Content Knowledge) framework.
4. To suggest practical ways of how technology could be integrated into Education.

Literature Review

This review focuses on many of the researches already laid on technology integration in the education sector. Analysing the different literature will bring better understanding and insight to this research. One important aspect of the review focuses on the diffusion theory. Rogers (1995) defined the theory as the process by which an innovation is communicated through a certain medium over time among members of society. Diffusion theory suggests that there should be an uplifting curve between technology integration and adoption. This progression starts with the introduction of an innovation or technological tool and ends with its adoption or rejection that naturally occurs through a span of time. This theory demands constant reviewing to analyse the effects of technology on teaching and learning, as the adoption occurs over time and in varying degrees.

Integrating educational technology

There is no doubt that technology can transform teaching through its integration. There have been numerous researches regarding the integration of technology in education and how beneficial it can prove both for the teacher and the learner. Mabel CPO Okojie, Anthony A. Olinzock, and Tinukwa C. Okojie.Boulder (2011) stated that technology as a medium for teaching and learning should be considered as an integral part of instruction and not as an object exclusive to itself. Moreover, technology integration should be viewed from different perspectives so that teachers can have the foundation on how to implement technology successfully into the classroom or outside of the classroom.

Collaborative learning

Chandra Lye (2018) stated that much progress has evolved in the technology industry exponentially over the last few decades with new and modern tools to help teachers reach their students. Collaborative learning whether held in a traditional way or online through Microsoft Teams, Google classrooms, Zoom, or other platforms has gained much importance in the new learning model. E-collaborative learning is very popular and includes collaboration with features to discuss and share among peers and teachers. Gaillet (1994) pointed out that collaborative learning has proved to be a successful approach and gives students freedom to learn from each other.

Learning outside the classroom environment

Mobile learning and E-learning have gained a lot of popularity and have taken learning and teaching outside the four walls of the classrooms giving students the opportunity to learn at their own convenience and pace. Scheming mobile based pedagogical content will help students to learn at any time and anywhere thus keeping them actively engaged. E-books are now embedded with a lot of features that inevitably enhance the learning experience of the students. Mobile learning is making its place in many educational institutions' learning ecosystem. Vishal Dani (2018), pointed out that traditional learning spaces are phasing out giving space for collaborative spaces with high-tech smart boards or Jamboard and smart pods changing the entire ambience of the classroom thus helping students to embrace technology fully.

Interaction in classroom

Bringing technology into classrooms changes the whole learning experience and makes the class lively and interactive. The flipped classroom methodology allows for more engagement and practice in the classroom. Lang (2005) declares that there are many strong points for integration of technology in the classroom, particularly when it comes to languages. The use of computers and softwares can really help in improving the language skills set of students using the Internet to search for information and to accede to various platforms that can make learning much more interesting, engaging, and innovative.

Rodney X. Sturdivant, Penelope Dunham, and Richard Jardine (2009) declare that in this twenty-first century available technology should be used to solve problem solving techniques for students. Advancement in recent years has changed the way students use technology. Even in a Mathematics class technology has allowed students to work on problems much faster than before. As the integration of technology gradually sets its imprint in a subject area like Mathematics the need to develop and implement faculty development programmes for technology-based instruction becomes a must. Integrating a technology-supported focus on problem solving into a mathematics programme is more of an evolutionary process, not a revolutionary one. The implementation of such a programme involves gradual changes over time in curriculum, pedagogy, and assessment. Moreover, faculty development to support such a technology-based curriculum is best done incrementally. Used appropriately, technology can be an effective tool that can enhance instruction and make the classroom more exciting than ever.

Augmented and Virtual Reality in the classroom for immersive learning

Fullan (2005), a renowned expert in change theory, stated that "educational change depends on what teachers do and think, it's as simple and complex as that." The acceptance of change is the main requirement for technology integration. Technology is evolving continuously. It is an ongoing process. It demands continual learning. Change is not always easy. The initial human reaction to change is resistance. Resistance retards change, but change is inevitable. Teachers should strive to make technology a routine part of their classroom, while using it to enrich learning activities. Technology should not be used just for the purpose of using it without any purposeful outcome.

The main point of attraction of technology integration activities should not be on the technology that is used, but on the student activities that are conducted using technology. Technology integration does not happen by accident. Teachers must find ways on how to incorporate student use of technology into meaningful classroom activities in their lesson plans. They should find ways to use technology that enhances instruction and improves student learning. With Augmented Reality(AR) and Virtual Reality(VR), digital learning has been given new perspectives. The use of AR and VR in the classroom makes studies more interesting and immersive. AR can transform the classroom in several ways, such as pre-made content using AR apps, AR-enabled worksheets, and AR walls, thus enticing students in their learning.

Gamification and Artificial Intelligence

According to Bonde et al. (2014), merging gamification with simulations improve the learning effectiveness and motivation of students compared with traditional teaching. However, further research is required to scrutinise whether these outcomes can be inferred to a general inclination. It has been reported that even the toughest exercise could be solved using gamification. Adoption of virtual games and gaming technology has made it easy for students to indulge in difficult subjects thus making the subject much simpler. Artificial Intelligence is also starting to remodel the educational system. AI enabled tools like Cognii - a virtual learning assistant that offers great potential for tutoring.

TPACK Framework

Punya Mishra (2014) states that TPACK framework attempts to capture some of the essential qualities of knowledge required by teachers for technology integration in their teaching while considering the multifaceted nature and knowledge of teachers. Major focus of this framework is the interconnection between the three primary forms of knowledge, namely Content (CK), Pedagogy (PK), and Technology (TK). Using this framework effectively and in a structured way can offer a productive and constant approach to many of the difficulties that teachers face in implementing educational technology in their classrooms. Dr D Moor (2015) stated that TPACK models help teachers develop their digital pedagogies and overlays the way how to engage students in learning collaboratively.

Research Methodology And Findings

This section discusses the methods that have been used in the collection and analysis of data to answer the research questions. It explicates the research design, sampling methods, data collection techniques used, and how data collected from the research has been analysed. Both quantitative and qualitative approaches have been devised for data collection and analysis for this research. The data collection was based mostly on the literature review, observation, interviews, and questionnaires. The target audience for this research are students, teachers, and lecturers from both secondary and tertiary institutions, government and private.

Qualitative and Quantitative Research

Classroom observation and interviews were methods that were used to analyse how technology could be integrated during instructional time. The findings were based on several class schedules and are discussed in the analysis and findings section. For quantitative research, a survey based on questionnaires was conducted to determine the challenges of integrating technology into education.

Literature Research

An extensive literature review and analysis of the technological tools and framework for the purposeful integration of technology in education has been presented in this paper. The prime basis of information was derived from authorized web pages of TPACK, different institutions and organisations as well as published literature in journals and textbooks.

Research Design

Taole (2018) stated that research design is the process that guides the researcher in gathering, analyzing, and evaluating observations. It provides a way to prove to the investigator the findings under analysis. Sampling and data collection methods are covered under this section. Areas of interest include scope, rationality, and the validity of the TPACK framework and educational technology.

Target Groups

The main target groups for this study were students, educators, lecturers and heads of institutions - primary, secondary, and tertiary levels, at Mauritian academic institutions, both private and public.

Primary education
As at March 2019, 319 schools provided primary education with a school population of 85,730, of whom 49.7% was girls (Statistics Mauritius, 2019).

Secondary education
Secondary institutions consist of 69 state colleges numbered 69 and 111 private aided and non-aided schools. Student enrolment stood at 108,562 in 2019(Statistics Mauritius, 2019).

Tertiary universities and institutions
Mauritius has 6 universities, 4 state and 2 private, and around 35 tertiary institutions. The total number of students enrolled in tertiary-level programmes was 47,398.

Sampling Techniques

The sampling group was very much diversified, ten primary teachers and 10 heads of school were interviewed, and 2 classes of primary institution went through observation similarly for secondary instructions. Fifteen lecturers and five heads of faculty were questioned at the tertiary level. Questionnaires were distributed to a hundred faculties comprising primary, secondary, and tertiary level. A hundred and fifty forms were distributed to students at different levels. Out of 100 questionnaires given to faculties, 70 of them were filled correctly, and 30 were incomplete, resulting in rejection. Out of 150 questionnaires given to students, 130 were well received and fully filled, while 20 did not reply.

Data Collection Methods

Triangulation has been used as the data collection technique as more than one method has been used in the process of gathering data. This ensures the validity of the research as several samples of data have been collected for the same research. Literature review, interviews, and questionnaires have been used in the process.

Questionnaire

The questionnaire consists of ten questions, out of which 8 were multiple choice, allowing ease of answering and 2 were open-ended. Multiple choice provides respondents with a complete overview of the topic of the research while open-ended questions helped to gather more intensive views of the respondents. The questionnaire was kept clear and short to avoid respondents losing interest in filling in the form and to have a high response rate. It was pre-tested with internal staff of my organisation before handing over to respondents. This was done to identify any anomaly or unclear questions in the form.

Interviews

Formal interviews were conducted with the author and different heads of schools and heads of faculties. The interview followed a formal plan and respondents were allowed full opportunity to express their opinion independently. Permission to record the interview was not granted for privacy reasons, but notes were taken to keep track of all that was said and for further analysis and interpretation.

Reliability and Validity

The same questionnaire was given to all respondents, to maintain reliability of the study; thus, all respondents will have the same understanding of the questions.

Regarding validity, Taole (2018) mentioned that a research is valid if it measures what it was intended to, and covers all research designs and facts. Several methods have been used in this research to obtain both reliability and validity of data such as:

1. Analysis of literature review
2. The use of both interviews and questionnaires
3. Having pre-tested questionnaires, with simple and clear questions
4. No personal data concerning respondents were collected, nor data from their respective institution, allowing freedom of expression.

Data Analysis, Findings and Interpretations

Data analysis involves detailed investigation and elucidation of the data collected. The data collected was analysed and interpreted to give the value of the data collected. The research collected both qualitative and quantitative data. The transcripts of the interview and the questionnaires were the prime factors in my data analysis. The questionnaire was set to determine the challenges of technology integration and the correlation with Technological Pedagogical Content Knowledge (TPACK) framework. A brief summary is illustrated below:

Table 1: Evaluation of Criteria

Challenges for purposeful integration of technology	Findings and Interpretations
Access to technological tools	50% of respondents replied positively to this criterion.
Right IT Competency	60% stated that right IT competency is essential for successful integration of technology
Remodelling of classroom	Only 30% of the respondents replied positively to this criterion. Many stated that this is not necessary for purposeful integration of technology.
Adoption of new methodologies: BYOD Hybrid learning Flipped Classroom Online teaching	70% of the respondents showed very positive indications for this criteria in general. In a BYOD environment, every student brings his own device to use for academic purposes (Grant & Barbour, 2013). The concept of Hybrid or blended learning refers to an educational environment where educators use digital tools in native or flipped classrooms environment on a regular basis. From the findings of the survey it could be acquiesced that this type of learning methodology has a positive reaction. A flipped classroom is completely different from the traditional style of content acquisition and application. In this type of learning environment, content knowledge is acquired outside of class. Many respondents were very positive towards this methodology.
Investment in educational technology	70% of the respondents showed very positive indication for this criterion - that there is a necessity for successful integration of technology. In a world where teaching is more focused towards students it is crucial to invest in the use of technology in institutions to meet the needs of students and to provide them with a different learning environment.
Difficulty on how to integrate the new trends in Educational technology: AR & VR, Gamification, AI, Mobile and E- Learning, Social Media, new platforms and software with pedagogy and content	50% of the respondents stated that they have access to technology but they don't know how to integrate technology with pedagogy and content.

Internet Access	60% of the respondents stated that right IT competency is essential for successful integration of technology.

Analysis of Findings using TPACK Framework

Based on the results of the survey, it can be determined that the following criteria, namely, access to technological tools, having the right IT Competency, investing in educational technology and having a good internet connection, is crucial for integrating technology in teaching. All these criteria correlate well with the TPACK framework.

Technological Pedagogical Content Knowledge (TPACK) is a framework that highlights the knowledge teachers need to teach effectively with technology. This framework outlines how the content is being taught and how the teacher imparts that content to the student, that is, the pedagogy. This forms the basis for any effective technology integration. This approach is essential because the technology being implemented must communicate the content and support the pedagogy to enhance the learning experience of the student.

The findings of the survey provide the following suggestion for integrating technology in education successfully: Using TPACK framework to assist teachers in effectively integrating technology:

Step 1: Select the technology or software to be used for the topic.
Step 2: Analyse the learner or the focus group of learners.
Step 3: Define the aims of the topic to be discussed.
Step 4: Select the technology to be used that will suit the pedagogy and content.
Step 5: Utilise the technology, have participation of students, involve students through PowerPoint presentations, and students to share their insights.
Step 6 : Evaluate the learning process before and after.

Conclusion and Future Recommendations

With the rapid evolution of information technology in the education sector, it is not impossible to keep the teacher away from the technical scene. Integration of technology does not eliminate the role of the teacher; we are not talking about classes being handled by Robots or AI enabled chatbot, but, on the contrary, the teacher will have an additional role to play, being the essence and master of the whole process. The teacher should be kept up to date with modern, new, emerging technologies that can be adapted to the classroom environment.

The success of technology integration is not based on the technology but it is based on how technology can be used in the classroom and how the pedagogy can be transmitted from teacher to student, to a learning environment that is dynamic, student-centered, creative, flexible, and innovative, and that allows for integration to happen seamlessly, and where students can interact

between each other in a peer-peer setting or hybrid mode with or in the same class or around the world. The TPACK framework discussed in this research paves the way for purposeful technology integration in education and this model coupled with training and embedded classroom monitoring can bring positive changes in the learning environment (Newman, Coyle & McKenna, 2015). Used as a frame of reference, TPACK can provide teachers with a comprehensive understanding of how technology, pedagogy, and content can be amalgamated for seamless integration. The Triple-E framework can help them choose the best technology to adopt.

Technology integration cannot be done abruptly; it is more of a phased approach. Lisa Dietrich (2018), pointed out that integration can happen only when there are no barriers to its integration, and criteria such as access to technology, infrastructure, internet connectivity, necessary IT competency and a defined learning environment is available. However, not only the frameworks discussed in this research should be taken into consideration for purposeful integration but other domains such as the type of learning environment, the level of integration of technology, and the engagement level of both student and teachers, should also be taken into account.

Framework Recommendation

TIM (Technology Integration Matrix)
The Technology Integration Matrix (TIM) framework is a well-structured model that describes how technology can be used to enhance learning. TIM englobes five interdependent characteristics of learning environments arrayed into five levels of technology integration, namely, entry level, adoption, adaptation, infusion, and transformation level. Such a framework needs to be considered for purposeful successful technology integration in the educational system.

Triple E Framework
The Triple E Framework was implemented for educators to facilitate their task of how to select tools to meet their learning outcomes and design learning experiences, so that tools have a positive inclination on student achievement and learning goals. This framework can be used as a coaching tool to support teachers in their choices around technology tools.

Limitations of the Study

The study does not analyse critically how, around the world, different educational institutions are integrating technology successfully and what are the challenges they are facing. It neither focuses on specific subject areas such as languages, Mathematics or Psychology where technology integration could be a bit more difficult but gives more of an overall viewpoint of how technology could be integrated wholesomely into the educational ecosystem. Although it provides a summary of the challenges teachers face regarding integrating technology into curriculum, it does not focus on the solutions completely, apart from the utilisation of the framework; but this could be part of another research work in the future.

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An Evaluation of the Acceptance of Moodle by the Faculty at a Rural University in Zimbabwe During the COVID-19 Lockdown Period

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Abstract

The outbreak of the COVID-19 (coronavirus) has disrupted every aspect of life, including education. To ensure less disruption, Higher Education institutions (HEI) are increasingly adopting digital Learning Management Systems (LMS). In March 2020, Universities in Zimbabwe shut down their campuses in response to the government's call for a lockdown to contain the spread of the COVID-19 infections. While this was a noble idea as it prioritised the students' and staff's safety and wellbeing, it resulted in the abrupt end of the semester. Due to this pandemic, Faculty suddenly found the use of technology as the only feasible way to deliver content to students. This paper examines the acceptance of Moodle during the COVID-19 pandemic at a rural university in Zimbabwe. An adapted Unified Theory of Acceptance and Use of Technology (UTAUT) model provided the theoretical framework for the study. A total of 114 faculty staff completed a pre-training questionnaire based on the adapted UTAUT model. The survey results revealed that Faculty staff were constrained by digital skills, internet speed, cost of data, and availability of appropriate hardware such as laptops for developing teaching and learning materials. The results of this research could be used by policymakers and other institutions in developing countries to implement technology-based learning for 21st-century learners during disruptive events effectively. The study can also stimulate discussions on how HEIs in developing countries should tackle the challenges they face when implementing e-learning.

Keywords: COVID-19, e-learning, UTAUT, Higher Education institutions, Moodle

Introduction

The novel coronavirus of 2019, commonly known as COVID-19, which was declared by the World Health Organisation in March 2020 as a global pandemic has forced many Universities worldwide to abruptly close campuses and shift to virtual learning, (Marinoni, Land, & Jensen, 2020). The purpose of this paper is to highlight how the Faculty at Lupane State University (LSU) accepted the new norm. Essentially, this research also looked at the acceptability of this sudden shift to ensure continued learning as well as the challenges faced in implementing technology-based education in its entirety in a rural setting. LSU is a government-run higher learning institution in

Zimbabwe established in 2004. LSU is the only rural-based university established by the government, created to bridge the academic divide between the rural and the urban. Most Internet Service providers shun rural areas due to a lower customer base. Over the years LSU relied on a slower microwave link for internet access and only in 2019, a fibre link was installed. Usage of technology for learning has, therefore, not been a top priority for the institution because of infrastructure challenges.

Before the closure of Universities due to the pandemic, students needed to attend at least eighty per cent of the face-to-face lectures. The institution had used a blended learning approach in lesson delivery, with the traditional classroom being the predominant method. The blended approach provides both online and offline experiences to the students (Lalima & Dangwal, 2017). In 2017, LSU implemented the Moodle Learning Management System (LMS), and lecturers were trained on how to use the platform. In January 2020, statistics from the LMS server showed that the usage of the online learning system by lecturers was barely 30%, with most lecturers preferring face-to-face teaching. In March 2020, the university was shut down amid the pandemic, and the university management recommended a 100% shift to online learning. Foreman (2017) notes that while Learning Management Systems are very useful in enabling training and education, they are not a cure for all learning challenges faced by institutions. Similarly, Bao (2020) argues that going entirely online requires substantial preparation on the part of the Faculty. Therefore, this research seeks to examine the perceptions of faculty members on the acceptance and usage of the Moodle LMS during the COVID-19 shutdown period. Our paper is organised as follows: the next section discusses the research problem, followed by a review of related literature. The theoretical framework guiding the study is then presented. The subsequent section outlines the methods where we outline the study's setting and materials used. The next section analyses and discusses the results. The next section provides the study's recommendations. Finally, the implications of the study and its limitations are highlighted in the conclusion section.

Research Problem

Effective e-learning implementation is a complex project that has many facets that need to be considered. These facets, described by (Marshal, 2007) in the e-learning maturity model, include the pedagogical aspects of e-learning, the creation and maintenance of e-learning resources, oversight and management of e-learning, evaluation and quality control of e-learning through its entire lifecycle and institutional planning and management of e-learning. During the COVID-19 pandemic, the challenge faced by Lupane State University (LSU) was how to quicken the adoption of the Moodle LMS among academics as part of the emergency response to the closure of the campus. The LSU academic faculty were under enormous pressure to become proficient in the use of the Moodle platform – while at the same time continuing to deliver on their teaching commitments. Many pedagogical aspects were not covered in the initial training that was conducted by LSU in 2017. Besides, not all students could participate in remote learning because of problems related to access to the internet. LSU academics battled with what to do with learners that had no access to the internet and how to communicate with learners effectively. Like most universities in Africa, LSU had installed the Moodle LMS as part of the e-learning

implementation strategy. What the university had not done was to institutionalise e-learning, implying that the policies of the university did not make the use of online learning platforms mandatory. Academics had a choice to use or not to use the installed LMS. The study aims to examine the acceptance of Moodle through a pre-training survey (ex-ante) during the COVID-19 pandemic at Lupane State University. Moodle acceptance was examined within the context of an emergency environment and taking into consideration the complexity of any e-learning deployment. The study sought to answer the following research questions:

    i.   What are the significant limitations that hindered the use of Moodle by LSU faculty during the COVID-19 lockdown?

   ii.   What top conditions facilitated the acceptance of Moodle by LSU faculty during the COVID-19 lockdown?

Literature review

Scholars have noted that e-learning is cheaper and flexible, promising to increase access to education to marginalised communities who once faced access barriers (Andersson & Grönlund, 2009). During the COVID-19 pandemic where face-to-face learning is not possible, e-learning is offering the more feasible content delivery alternative to higher education institutions around the globe. The usage of e-learning tools has been rising globally due to the availability of many open-source learning platforms which are very easy to customise to meet the needs of the institutions and Faculty (Andersson & Grönlund, 2009). Serdyukov (2017) echoed the same, highlighting that e-learning was widening access to education for groups that were once marginalised by geographical locations or minority groups such as the disabled. HEIs around the world have been implementing e-learning to address challenges that students face relating to inadequate physical facilities and resources such as books (Sudweeks, Hrachovec, & Ess, 2010).

A large scale study by EDUCAUSE that covered over 75 000 students and 17 000 faculty revealed that only elementary features of the LMS were being utilised as the LMS was viewed as a tool for enhancing teaching and learning (Dahlstrom, Brooks, & Bichsel, 2014). Research on factors affecting LMS acceptance has been growing covering aspects such as limited access to ICT, the prohibitive cost of internet, lack of digital skills, inadequate technical support and lack of national or institutional culture (Serdyukov, 2017). Similarly, Gyamfi (2016) found that limited administrative and pedagogical support and inadequate access to ICT devices were significant hindrances to LMS adoption. Moakofhi et al. (2017) pointed out that an easy to use LMS, access to the internet, incentives for lecturers and a supportive culture were crucial for effective technology-based teaching. The acquisition of appropriate digital skills provides the lecturer confidence to use the LMS and is pivotal in adopting technology-based teaching (Tarus, Gichoya, & Muumbo, 2015). In a similar study in Malaysia, Wong et al. (2014) concluded that the lecturer's digital skills played a pivotal role in influencing adoption of Moodle. Alrawashdeh et al. (2012) applied the Unified Theory of Acceptance and Use of Technology (UTAUT) to predict the acceptance of a web training system. They noted that participants perceived system enjoyment and interactivity as significant determinants of adoption. A study to determine the factors influencing the adoption of an internet forum in Indonesia using the UTAUT revealed that user satisfaction and system quality were the significant determinants of forum usage (Sipahutar et

al., 2019). Another study in Kenya that utilised the UTAUT to determine the acceptance of an LMS found that institutional policies and training greatly influenced the adoption of the LMS (Maina & Nzuki, 2015).

Theoretical framework

The UTAUT is one of the most dominant models for predicting user acceptance of new technology or systems and has been refined over the years to improve its prediction. UTAUT is based on the Theory of Reasoned Action (TRA), Innovation and Diffusion Theory (IDT), Motivational Model (MM); Model of PC Utilisation (MPCU); the Technology Acceptance Model (TAM) and Social Cognitive Theory (SCT) (Abdekhoda et al., 2016; Venkatesh, Morris, Davis, & Davis, 2003). These models have been refined several times in light of changing technology, resulting in a robust and all-encompassing model. The previous models had a low user acceptance prediction rate, with the TAM only predicting only 40% of the variance (Legris, Ingham, & Collerette, 2003). The UTAUT has proved to be a reliable and accurate model with prediction rates of about 70% (Moran, Hawkes, & El Gayar, 2010). The model uses two dependent variables; the Behavioural Intention (BI) and Usage Behaviour (UB) and the four independent variables; Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Attitude Toward Using Technology and the Facilitating Condition (FC) (Venkatesh et al., 2003).

Methods

This study adopted a quantitative research design. The study used an adapted UTAUT model as the theoretical framework to gather views of Faculty on Moodle acceptance during the pre-training (ex-ante). We investigated the perception of Faculty towards utilising Moodle for teaching during the COVID-19 lockdown. Since participants are all Faculty members, the moderating variables (Age, Gender, Experience, and Voluntariness) were not considered. A questionnaire developed using the adapted UTAUT constructs was used for data collection (Venkatesh et al., 2003; Omer et al., 2015). A 16-question assessment instrument was used, and it utilised a four-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). A total of 200 full time and part-time faculty members were targeted for data collection, 114 usable responses were received. A questionnaire link was emailed to prospective participants. In terms of gender distribution, 77 (67.54%) were male, and 37 (32.45%) were female. About 18.4% of the respondents were PhD holders, while 81.6% were Masters holders.

Figure 1 shows the adapted schematic view of the UTAUT, providing an overview of factors affecting teaching and learning during the COVID-19 lockdown based on the Faculty's responses. White rectangles depict the facilitating conditions while the limiting conditions are in blue smooth shaped rectangles. The white ovals show attributes that can facilitate teaching and learning during the COVID-19 lockdown, and the blue ovals reflect the contextual conditions. Moodle supports constructive learning that is learner-centred, happens anytime and anywhere, self-paced, active learning (Olusegun, 2015). The constructive learning paradigm is ideal during the COVID-19 lockdown when face-to-face learning is not possible.
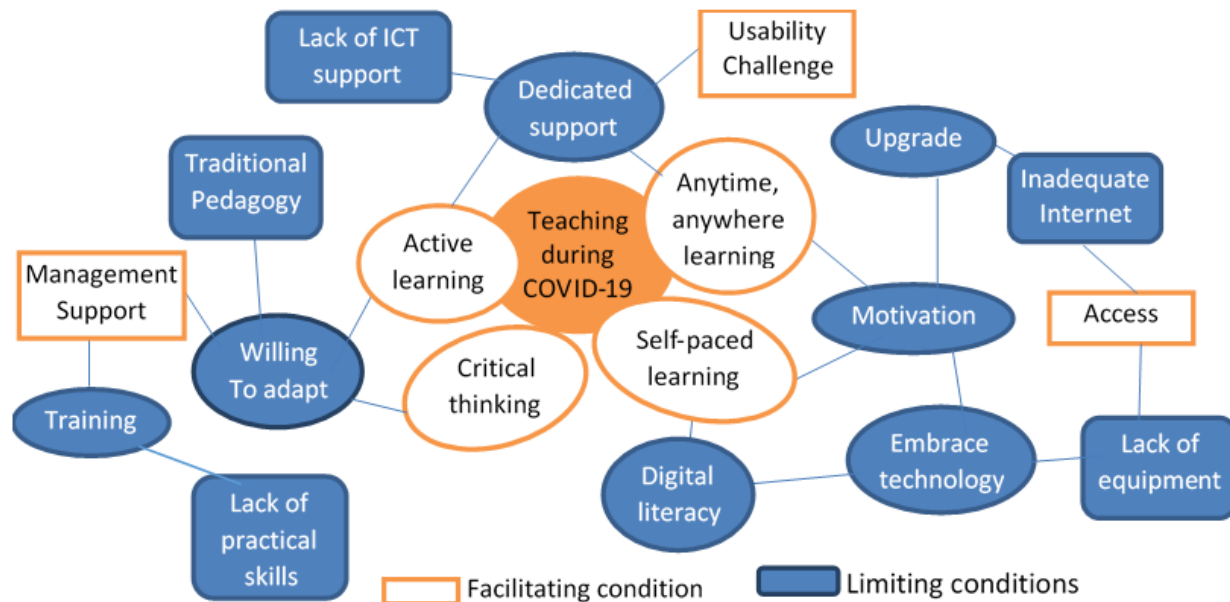
Figure 1: Adapted UTAUT model (Venkatesh et al., 2003; Omer, et al., 2015)

Results

The results show that 62 (54%) of the respondents had never taken an online course. Regarding knowledge of MOOCs (massively open online courses), 71% of the participants did not know these platforms, 16% knew MOOCs while 12.3% had taken a MOOC. Moakofhi et al. (2017) asserted that there was a need to create awareness and train faculty on educational technology tools to increase acceptance. The majority of the participants (77%) agreed that they possessed adequate computer skills to support Moodle, with only 22% reporting that they needed general ICT training to improve on their skills. About 81% of the participants were willing to spend at least two hours a week on Moodle, and this indicates a willingness to adopt Moodle for remote learning during the COVID-19 lockdown. Willingness to adapt to new technology is a vital UTAUT construct which allows academic staff to embrace Moodle, which can support teaching and learning during the pandemic.

The survey results revealed that 78.9% of the Faculty had theoretical knowledge of Moodle but had limited practical experience. Lack of practical knowledge reveals that faculty members required training. Maina and Nzuki (2015) and Moakofhi et al. (2017) reported that training and management support were critical in LMS adoption. Similarly, Ash (2013) established that institutions should conduct hands-on Moodle training with practical demonstrations. Serdyukov (2017) noted that effective LMS acceptance requires institutional leaders to create a culture that supports implementers and Faculty in terms of plans and resources. In a related study in Botswana, Moakofhi et al. (2017) concluded that ICT support provided to Faculty was crucial in Moodle acceptance. Management support, training and ICT support are essential facilitating conditions of the adapted UTAUT model, which positively influenced the adoption of Moodle at LSU.

According to the adapted UTAUT model, access to technology or the internet can impact the acceptance of Moodle. About 38% of the participants agreed that slow internet access was a hindrance to Moodle usage. Obisat and Alrawashdeh (2013) highlighted that effective use of an LMS was dependent on a stable internet connection. The findings were corroborated by Anderson and Grönlund (2009), who concluded that reliable internet and access to appropriate devices were vital in LMS acceptance. About 80% of the Faculty relied on the institutional internet and devices, and this can negatively affect LMS adoption, as noted by Obisat and Alrawashdeh (2013) and Shahadat et al. (2012). A study in Botswana revealed that about 60% of the lecturers believed that lack of ICT support negatively affected the utilisation of the LMS (Moakofhi et al., 2017).

The results showed that the adapted ATAUT constructs had a positive effect on the acceptance of Moodle as a tool to support teaching during the COVID-19 lockdown. The facilitating conditions directly impacted the acceptance of Moodle. Limited internet access, reliance on devices domiciled at the institution, lack of training were a hindrance to Moodle acceptance and usage. The results are consistent with observations by Naresh and Reddy (2015) who noted that LMS implementation in developing countries suffered because of inadequate infrastructure, cost of data, lack of institutional and national policies and lack of digital skills. Moakofhi et al. (2017) found that 93% of the respondents in a study in Botswana agreed that the institution's infrastructure was inadequate to support e-learning based on the network's speed and capacity. The participants' willingness to devote at least two hours a week on Moodle indicates their desire to accept Moodle for remote learning during the COVID-19 lockdown.

Recommendations

The employment of techno-pedagogy in the university must be viewed as the new norm. Not only should this be seen as a disaster management technique but as a tool to give the university a competitive edge. We note that the university cannot implement e-learning without adequate infrastructure related to e-learning servers, back-up power systems and adequate bandwidth. Additionally, the escalating costs of data in the country may require the university to support lecturers and the students with mobile broadband internet. The university ought to develop an e-learning policy and align it with the university's strategic plan. We recommend the establishment of a Centre for Educational Technology, which will bring together ICT and educational experts. The centre will ensure continuous improvement of e-learning development and support. An e-content development strategy must be considered to quicken the process of digitising the LSU academic programs by involving partners such as Coursera and edX. The identification and nurturing of e-learning champions are critical for promoting and continuous improvement of e-learning implementation. We further recommend that networks such as the Zimbabwe Research Network (ZimReN) should be supported by the government to provide cheaper broadband for educational institutions, ensure collaboration and sharing of best practices by the universities in Zimbabwe. Such partnerships can also help in ICT resource mobilisation and access to shared resources. Furthermore, the university must implement strategies that offer incentives and inspire innovative methods of teaching.

Conclusion

The pre-training results show that the respondents had accepted Moodle as a tool for remote learning during the COVID-19 lockdown period. E-learning implementation is a complex process that requires the monitoring and management of various aspects – infrastructure, pedagogy, policies, quality assurance and continuous training for staff and students. Barriers that affected acceptance and usage of Moodle include limited internet access, reliance on devices domiciled at the institution, lack of training, cost of data, lack of institutional and national policies and lack of digital skills. LSU leadership played an important role in facilitating a conducive environment for virtual training by providing staff with mobile broadband data. The ICT support staff actively supported the staff during the virtual training. The academic staff were willing to be trained on Moodle usage. Faculty had dedicated over two hours a week for Moodle usage. Staff believed that the successful implementation of Moodle was based on adequate ICT support. LSU Faculty accepted the new norm by participating actively in a virtual training that was organised to support the migration to online teaching.

The survey was a pre-training (ex-ante), and we wish to conduct a post-training survey to determine the level of adoption and come with more conclusive results. The implementation experience at a rural-based university creates a vital case study for other rural universities elsewhere. The sample used in this study was small, and this may affect the generalisability of the results. The study was conducted during the COVID-19 pandemic with social distancing requirements which may have limited the use of other methods for data collection such as face-to-face interviews. Further research could be conducted across many institutions and capturing the views of the students. A longitudinal study that compares pre and post student performance could provide a more precise assessment of the impact of Moodle adoption as an alternative to face-to-face teaching.

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Young Learners' Engagement in learning Bharatanatyam Online during COVID-19 Pandemic

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Abstract

Bharatanatyam is an ancient Indian classical dance which is learnt as a discipline to groom the character and physical traits of the learner. Many parents who are traditionally culture oriented introduce their children to this dance form at a very young age. Students are normally familiarised with adavus (steps), mudras (hand gestures) and dance pieces. Students' natural talent is ignited so that she or he can perform this art confidently on stage. Nonetheless, when it comes to learning performing arts online, there are many challenges teachers and students face. It is indeed reckoned that an online class in this dance form cannot replace the traditional Guru-Shishya (Teacher-Student) way of imparting this knowledge. This research aimed to explore determinants that contribute to student engagement when learning this dance form via an online medium. The study is relevant in this present COVID-19 pandemic where learning took place online while maintaining social distancing. The targeted audience was young learners from the age of 2 ½ years to 11 years from different countries, under the virtual guidance of an experienced teacher and stage performing artist having more than 25 years' experience. A qualitative methodological approach was adopted using (i) observation of online classes conducted with the young learners, (ii) online interviews with parents and the teacher, and (iii) exploring the pedagogical approach used by the dance instructor during the online teaching. The key findings led to an illustrative model depicting the 6Cs related to teachers, 4Cs related to parents, 3Rs related to learners, and 3Ss related to technology; all determinants contributing to the engagement of young learners towards this Indian classical dance practice.

Keywords: Online Learning, COVID-19 Pandemic, Bharatanatyam Dance, Student Engagement

Introduction

The infiltration of the infectious and deadly Coronavirus disease (COVID-19) in many countries around the world has caused much fear, anxiety, physical pain, and immense stress to mankind, who is now striving to survive on earth (Serafinin et al., 2020). Globally, as at mid-August 2020, World Health Organisation reported the drastic disaster of the COVID-19 pandemic with 21,756,357 confirmed cases including 771,635 deaths (World Health Organisation, 2020). At this time, many safety measures had been taken to protect and save lives on earth. Governments, organisations, societies, and families are all searching for ways and means to curtail the negative impact of physical and mental stress due to this pandemic. Somehow, during the COVID-19

lockdown, many individuals strove for their physical, mental, emotional, and social wellbeing (Bansal et al., 2020). Accordingly, caring for their own wellness could be done through indoor activities, gardening, interior home decoration, yoga and meditation, listening to and creating music, and dancing, among other activities. Although music is very soothing for the physical, mental, and emotional being, it is observed that any form of dance has an extra special package of contributing to the physical well-being, along with a positive impact emotionally and mentally. Hence, dance is regarded as an evolutionary gift contributing to one's self-protection and wellbeing (Hanna, 2017), and its rhythmic movements contribute to cultivating expressions and varying emotions (Akandere and Demir, 2009). Researchers in the field of dance point out its benefits on various dimensions namely physical, which reveals the energy of the individual (Andrews, 2002) and effective communication (James, 1999).

Background Study

Bharatanatyam Basic Concepts

These originated in Tamil Nadu, South India. The definition of Bharatanatyam is based on bha - expression, ra - rhythm, ta - beat, and natya - dance (Iyenger, 2014). As it is known as the Dance of Bharata (India), Bharatanatyam Dance (henceforth referred to as BD in this paper) is among the eight classical dance forms of India, and is recognised for its harmonious blend of 'bhava', 'raga', and 'tala' involving all the aspects of dance, drama, and music in it, while the hand gestures or hasta mudras are very highly developed aspects of art and a means of communication with the Divine (Sharma, 2013). This form of dance is a unified mixture of Nritta being rhythmic body movements, Nritya being expression using eyes, hands, and facial movements which express Rasa (sentiments), Bhava (moods)), and Natya (dance drama based on legends) (Bhavanani and Bhavanani, 2001). The BD movements are synchronised to Carnatic (a form of South Indian) music, through story narrations, using vocal and instrumental music (Iyengar, 2015). Adavus (footworks) are simple choreographic units combined to create a dance sequence in BD and are synchronised with the rhythmic pattern of beats known as Taal (Mallick et al., 2017), together with key postures. A dance item which is a combination of steps and choreography for a particular song is called a Margam. Dance pieces start with hand, shoulder, and neck movements, in synchronization with different adavus.

The research conducted by Iyenger (2014) on Bharatanatyam and transnational literacy through socio-cultural pedagogy shows that this dance form is a "culturally driven activity", while and Graham's study on the relationship between dance education and the intellectual, social, and emotional literacies agrees with this. This form of dance encompasses many physical and stretching exercises, helping to tone and shape the body, and create endurance towards stamina building. Moreover, such a performing art is a conducive vehicle that teaches children valuable social and language skills about their cultural roots, and encompasses family, community, and teacher support, which consequently influences and enhances the learner's cognitive, emotive, and social skills. (Iyengar, 2014) but requires a favourable learning environment so that this form of education can take place successfully. Dance performances give the dancer opportunities to execute through socio-cultural instructions, internalising the characters to be depicted through

narrative modes, which ignite the sociological, psychological, and intellectual facets required for optimal performance (Graham, 2011).

Teaching Approaches for BD

In general, in a traditional physical Face to Face (F2F) class, children are dropped off by their parents at the teacher's teaching institute for an allocated scheduled duration of time. For a class to happen, it depends on the teacher's pedagogy style, learning environment, and students' willingness to learn. Teachers assess whether the children either absorb the teaching methods or cannot grasp the lessons (Cornell, 1999; Duru, 2010). Traditional methods engage students who learn in this environment, but disengage students who learn differently using alternate methods of learning (Ultanir, 2012). Therefore, teachers must look for innovative teaching strategies to help students appreciate their online dance classes. It is also noted that alternate teaching methods may produce higher engagement in students (Zakaria, 2013). Bharatanatyam necessitates an initial training of a minimum of six years with full commitment, regular practice to build stamina, and to create endurance and concentration, altogether culminating in a full recital on stage known as Arangetram (Jayaram, 2020). Nevertheless, it is worth noting that, in the case of teaching BD, some teachers do not find it an easy task in providing accessible teaching methods to engage students.

Technology Adoption for E- Learning

The adoption of blended learning models have been seen in educational and non-educational institutions as a useful construct when considering a mental mode (Zhonggen, 2015). With the emergence of web based technologies for teaching and learning, namely, e-learning, many tools have been available, namely, slideshows, word documents, PDFs, power points, videos, webinars, and communication chat forums, which allows the students to fit learning around their lifestyles (Clover, 2017). Further, education strategies have recently seen a drastic shift from face-to-face learning methods to e-learning (Ichsan et al., 2020) using language apps, virtual tutoring, video conferencing device or online learning software (Li and Lalani, 2020). In the field of dance, typically the Bharatanatyam style, Bharatnatyam Guru Jayalakshmi Eshwar pointed out that technology has the role of a teacher which she adopted by recording new items to be learnt bit-by-bit and uploaded them for all her professional level students living abroad (Jain, 2019), and she also observed that young students of six years could make use of mobile phones to capture dance movements to practise afterwards.

Research Methodology

A dance school located in New Jersey was chosen as a case study to decipher the level of engagement of the young learners in online BD classes. The teacher is an experienced Indian born professional BD dancer having more than 25 years of stage performance and teaching experience. She is presently a resident in New Jersey. The school name is not mentioned in this paper for confidentiality reasons. Unlike any social science or pure scientific subject being taught, instructors of music and dance subjects prefer to train small batches of students on a face to face

basis for a better transfer of knowledge and skill to the learners. In our case study, the batch of young learners for online BD class consisted of a population of only eight female young students dispersed in various countries. The whole population was surveyed as per the adopted research methodologies as discussed below in this section. The qualitative data analysis methods (Bernard, 2000) used were (i) narrative analysis to examine the contents of the data captured through online interviews with the teacher and parents and through the online observations sessions, (ii) discourse analysis to scrutinise social context and interactions with the respondents, and (iii) grounded theory to observe the instances happening during the 28 observation sessions online to originate causative explanations.

The age group was from 2 ½ years to 11 years. These young students are from 3 countries namely, India, Mauritius, and Maryland Washington DC. Six students started for the first time their apprenticeship via the online class mode during the lockdown period of the COVID-19 pandemic, as from the first week of May 2020, while two students were already engaged in learning dance on a face to face learning mode prior to the pandemic lockdown. A qualitative methodological approach has been adopted using (i) observation of online classes for 28 sessions over 3 and ½ months as from the first week of May to second week of August 2020, to explore the teaching and learning approaches in the online classes as well as the reactions of students and parents (ii) online interviews with parents and teacher, and (iii) an experiment for relearning adapted from Rawson et al. (2013). In view to the relearning approach, two students living in the same country were chosen to test and measure the level of understanding and learning which took place online. In order to capture the data, an invitation through email was sent to the researcher to attend the online classes. Zoom was the selected online video application. Its functionalities were appropriate for both the teacher and the young learners. The classes were conducted online thrice weekly. From the observation, it was noticed that all the young learners were accompanied online by their parents. They mostly used laptops. The parents reported that most of the time, connectivity was stable and online classes could be conducted without disturbances.

Findings, Analysis and Discussions

Findings discussed in different subsections below have emerged from observation sessions and online interviews with the dance teacher and parents as enumerated in the section above.

The 6 Cs of Teacher Engagement

The 6Cs, namely, Contents, Communication, Commitment, Culture, Coaching, and Control Evaluation, have been discovered as findings based on the following discussions.

Contents

On an observational note, a synchronous teaching approach was adopted online through zoom, on average 60 to 90 minutes of teaching, which was wisely divided into different practical lessons to capture the learner's attention. These lessons included physical warm up exercises, some basic steps (adavus), recitation of mudras (hand gestures) and dance pieces. The dance instructor

demonstrated the lessons in front of the students without any mirror teaching approach. Additionally, asynchronous teaching consisted of sending recorded videos related to lessons taught through whatsapp to the parents to facilitate learning.

Communication

Based on the observation sessions as mentioned, the dance teacher adapted to the mother tongue of the young learners. The teacher responded that the various languages used, namely Creole, French, Tamil, and English, were based on adapting to the students' requirements. For one student from Mauritius, the three languages, Creole, English, and Tamil were used interchangeably. French and Creole were used with the youngest student, while the other students were comfortable with Tamil and English. The parents perceived language as a very important asset for the instructor in her communication strategy, thereby establishing a good rapport with the learners.

Commitment

The dance teacher emphasised that her mission statement was to kindle the interest of children towards BD for their proper self-development at various levels, namely, physical, mental, emotional, intellectual, artistic, spiritual, psychological and behavioural. Her main objectives were helping children in overcoming boredom at home, creating opportunities for physical movements for healthy living during the COVID-19 pandemic, and imparting knowledge and skills of this performing art to children.

Culture

Observations showed that she was very friendly and caring, and adapted to every need of the learners. Besides, the teacher instilled values such as trust, understanding, and appreciation of each other during the online classes. All parents acclaimed her to be very considerate and patient when transferring knowledge and skills of this performing art online. Her positive attitude had a major constructive influence on the students who showed much appreciation of the subject being taught to them. This element of trust facilitated learning.

Coaching

Observations showed that the teacher is very flexible in her coaching or pedagogical approaches. The dance teacher stated that each of her students was unique and different. Accordingly, she adapted to each one's level of understanding while guiding each of them. She assessed each student's energy and level of capability, and adapted as per their needs. Moreover, the instructor used natural strategies to communicate with each of them. She stated that her guidance depended much on observing her students' behaviour online. Such a technique proved to be very effective for the young learners to be engaged in learning BD. The teacher also encouraged her young students to interact among themselves online during the teaching. Among such online activities were greeting each other when signing in, singing in the mother tongue, and performing

folkloric dances of their countries. Moreover, all parents confirmed their high satisfaction with the pedagogy used. They explained that they could phone her for any clarification of lessons.

Control Evaluation

The instructor evaluated her students' learning by observing each student online. After the online BD class, each student was required to record her individual dance practice. Parents were encouraged to record these dance practices which were sent to the teacher for correction. Students were also inspired to watch online the performances of their peers' class for their own corrections. The mentor confirmed that she had a preference for F2F physical sessions wherein on the spot correction is possible to ensure perfection. However, according to her, online classes had to be acceptable as she and most of her students were not residents in the same country and because online classes were appropriate during the COVID-19 pandemic.

It can thus be confirmed that these six components are determinants for the teacher to engage in teaching BD to the young learners supported by the parents.

The 3Rs of Learner Engagement

Receptivity, Readiness, and Relearning are the 3Rs that have been discovered as findings based on the following discussions.

Receptivity

Observations showed that the young learners were learning BD conveniently at home and were at ease during their online classes without much stress. Any student feeling thirsty, hungry, or even needed rest, was granted permission by the teacher to satisfy her needs. On an observational note, this style of convenience learning was appreciated by the parents.

Readiness

All parents perceived their children to be more attentive, disciplined, and conscious of time in F2F classes. During online classes, they noted that movements taught might be difficult to be captured by the young learners. They also found that the learners were distracted with other situations happening in their physical surroundings. The F2F physical classes were preferred by all parents. Yet, during the lockdown period, their children could safely learn comfortably from home in their private space. Interestingly, parents recognized online classes to be beneficial for their children to network with other peers comfortably and to grow fast. They confirmed such transformation happening throughout the 3 ½ months of online training. Lockdown period had also provided opportunities for students to practise daily. Such was the case for the Mauritian young learners. However, with school resumption in some countries referred to in this paper, the young learners could not devote much time for their regular dance practices. An Indian parent pointed out that her child was more enthusiastic when the latter connected to the virtual BD class with the dance teacher. The child also preferred live sessions rather than the recorded

videos sent by the teacher. The student from Maryland Washington DC, practised her lessons regularly.

Re-Learning

An experimental re-Learning exercise was conducted by a senior student of the dance teacher with the purpose to cross check whether the right learning happened during online classes. After three months and a half months of BD online training, two sessions of the experiment with two young learners who were accompanied by their parents underwent the experimental re-Learning exercise which was conducted on two different days at the home of the senior student in Mauritius. The two students were evaluated based on the same lessons taught by the teacher during the online classes initially, from stretching exercises, footwork, hand gestures, to the dance item, for a duration of 60 minutes. It was noted that the youngest student could interact more in the class by following the movements of the elder student. Experimental re-Learning sessions appear to be successful where lessons were not captured properly by the students online. The parents showed their immense satisfaction with these experimental sessions on a F2F basis.

Hence, these three components are important determinants for the young learner to engage in learning BD from her teacher, supported by the parents.

The 4Cs of Parental Engagement

These are: Cognisance, Commitment, Cause, and Convenience, and have been discovered as findings based on the following discussions.

Cognisance

Cognisance relates to the artistic knowledge, background, and experience of the parents in this case study. Two parents reported that they learnt BD previously at an elementary level. Another parent stated that her close relative is a stage performer and dance teacher who encouraged her child to learn BD. One parent did not have any basic knowledge and skills of this dance form. The fathers of two students had background knowledge of Carnatic music and skills, namely, a classical instrument and a guitar, and they have attended BD Arangetrams. In the case of another parent, she highly appreciated the talent of the dance instructor and was motivated to send her child to learn from this teacher. For the youngest student, the parents provided much support to the child during online classes, from physical warming exercises, footwork, hand gestures, and the dance pieces that were taught by the teacher online. The child had to be put for a nap before the start of the class so that she did not feel sleepy during the virtual classes.

Commitments

Traditional classes conducted on a F2F physical basis normally do not involve the parents' physical presence during the classes. Parents drop their offspring to the teacher's physical class scheduled for an agreed time period and then they come back to pick them up. In the case of virtual classes, either mother or father or another responsible party needs to provide assistance to the child during the online BD classes. It is observed in this particular case study that the parents provided their physical, mental, and emotional support during the entire classes conducted online. Parents could not move out of the room where the online class was conducted since young learners were distracted with other objects which prevented them from focusing on their lessons.

According to the dance instructor, the parents were obliged to be in attendance with their children since the students were very young to be attending online classes. She further stated that parents had a very crucial role in the learning process of their children since they are regarded as an important tool in supporting her teaching activity, although they did not interfere with the instructor's teaching activities. By observing their children during their classes online, parents could teach them after classes as well. The recorded dance footwork, dance pieces, and hand movements which were sent to parents via whatsapp helped the parents to correct and monitor their children's progress. For the teacher, she believed that teamwork should prevail among the teacher, parents, and students.

On the other hand, parents said they needed to dedicate a regular time slot for their children's online BD classes. Since the students were very young, their parents assisted them fully with the technological devices and Zoom application. The parents felt responsible to ensure the lessons were being transferred from the teacher successfully. In the case of the youngest learner, the mother attended on the child fully by demonstrating to the child whatever knowledge and skills were imparted by the teacher. The child could then replicate the live demonstration from the mother who was following the teacher's demonstrations. On the contrary, the eldest student took the whole responsibility of her BD class without much support from her parents. She could manage the technological devices, application, and time schedule alone.

Cause

Parents reported that their motivation behind allowing their children to BD classes on a virtual mode were to(i) avoid boredom at home during the COVID-19 pandemic, (ii) to learn dance at home due to the pandemic, (iii) appreciate the traditional culture of this performing art, (iv) initiate BD at a very young age apart from their academic studies, (v) spend quality time during the COVID-19 pandemic, (vi) perform physical exercises apart from watching TV and attending homework studies (vii) develop mental concentration and (ix) understand virtual classes at a young age by meeting other students online.

Convenience

Convenience for parents was based mostly on time factors. Although online classes varied according to the time zone of the students' country, it was very convenient for all parents since they were in the lockdown period at home and most reported that they were working at home. They could dedicate conveniently around 1 ½ hour to attend to their children for their virtual BD classes. However, two parents confirmed that noises created by other siblings distracted the concentration of their young learners.

Thus, the above identified determinants influenced the engagement level of the parents to support their children remotely for their virtual BD classes.

The 3Ss of Technology Engagement

These are: Surroundings, Service Enablers, Structural Supports and have been discovered as findings based on the following discussions.

Surroundings

It was observed that the teacher had set up a comfortable space at her home to conduct her BD classes online. Regarding the students' space zone, it was noted that the learners also had much physical space to learn dance virtually. One parent reported that physical space was a challenging aspect and believes that neighbours with good understanding act as a contributing factor to the learning environment of the student. It is remarkable to note that this parent had to convert his home office and prepare a temporary dedicated space for dance during online classes for BD. This special home classroom for BD comprised a tablet, laptop, and webcam, to facilitate his child's learning. The child could view her other online peers and teacher through a large screen. Contrarily, the parent of the youngest student testified that despite having a large dedicated space for dance practice and being supported by both parents and grandparents, such a large physical space was not convenient for the child, since she tended to move around and get distracted. The parent confirmed that the setup of a very limited space without any objects supported much in the concentration of the child. It can be deduced here that the age factor of the young learner and her understanding impact much on the optimisation of the physical space allocated for dance practices. Most parents confirm that their children benefit from convenience and proper space at home. All of them were relieved of being free from the stress of driving in traffic to drop off their children in their F2F classes.

Service Enablers

The service enablers related to the Information and Communication Technology devices used by the parents to enable learners to log in remotely to their BD class. These were laptops, tablets, smartphone and Zoom applications. Parents and students revealed that they were mostly satisfied with Zoom, based on the visibility of actions performed by the teacher. The amount of bandwidth was another service enabler which had a very huge impact on the accessibility of

virtual class via zoom application. Parents, learners, and the teacher all recognized that bandwidth issues and latency remain uncontrollable external factors linked with internet connectivity, causing delays during the online BD classes.

System Supports

These encompass technological supports such as internet connectivity as a very important tool to engage all stakeholders, namely the learner, parents, and teacher in the remote BD classes. However, it was noticed that the teacher, students and parents were sometimes experiencing instability of internet connection which led to the freezing of the Zoom application thereby causing disturbances during the delivery of virtual classes. The teacher admitted that during the start of the online BD classes, she noticed such latencies which were impacting negatively on her course delivery. Nevertheless, she later accepted these types of issues as being part of the online teaching mode. She reported to be highly satisfied with the Zoom application since her young students could see clearly their counterparts and interact with each other. In case students experienced any technological connectivity problems, she could shift to a whatsapp application immediately to enable the learning continuity of these students. The mentor appreciatively stated that she could record her online sessions in the Zoom application which she sent to students. Conversely, most parents commended the technological support to enable online learning of BD and also pointed out the related connectivity issues which they need to adapt to so that their children embrace and engage in learning BD.

Finally, these determinants related to technology impact much on parents, students, and teachers, towards engaging with technology to accept fully BD online classes.

Conclusions and Recommendations

Dance is among the most convenient ways to manage stress during this hectic time. From the research conducted, it has been found that learning this type of performing art requires the proper guidance of an experienced dance instructor. This art can also be learnt online, based on the teacher's pedagogical style, parental continuous support, appropriate technological tools adapted, conducive space and learning environment appropriate for the learner, as well as the student's interest in the subject. These represent major contributing factors for engaging online learning of the young learners for learning BD, irrespective of the proximity of the dance instructor. On a concluding note, this initiative which has emanated from the lockdown of COVID-19 pandemic, supports in the stress management of the young learners and can be found to mobilise concerned families in different countries towards grooming the young learners' knowledge and skills of BD. Parents are able to enjoy and spend quality time with their children.

Based on the above, a Young Learner Engagement Model for learning Bharatanatyam Online is illustrated below.
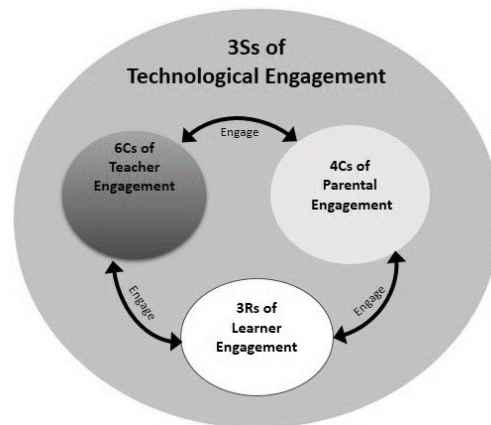
Figure 1: Young Learner Engagement Model for learning Bharatanatyam Online Authors' Own Compilation

The 3Ss of Technological Engagement represent the core element that supports teachers, learners, and parents to adopt and engage in learning BD online.

Future Research

Further research could be extended towards the setting up of a Learning Management System (LMS) for an online classroom for all categories of learners for BD. The instructor can post theoretical and practical contents of BD both on synchronous and asynchronous modes. The system could cater for student registration and to monitor their attendance. Teacher(s) can track the students' learning engagement via a tracking system when they access the learning contents. Students can post their recordings and queries on their wall which can be viewed by the instructor who can also correct their practical assignments. Additionally, the proposed LMS can also be viewed as a centralised BD repertoire based on knowledge management initiative which includes the possibility of creating new knowledge of BD discovered by the teacher and students, sharing new created knowledge expressed through new dance pieces and items and also reusing these created dance items.

Moreover, an online alumni system could be embedded to enable all the senior and junior students to meet online and share their knowledge and skills acquired. The relearning experiment could be conducted by the senior students and provide support to the junior ones. Ultimately, such an online strategy would enable creativity and innovation among students and instructor(s). Further to this e-learning strategy for BD, an online boot camp for BD programmes for young learners could be adopted for better engagement. A further suggestion may possibly have the full curriculum for BD accredited with a well-known university in BD and the performing art to be taught either online or a blended learning approach depending on the requirements of the learners. Supplementary research would be to conduct assessments for BD online for different categories of learners. Such an online BD platform could further be extended to non-

registered students with the opportunity to perform pieces or items of BD on a competitive basis. An example to be cited here could be the Guinness world record BD in the countries around the globe.

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Attitudes and Behavior of online learning amidst COVID-19 Pandemic: The case of Social Science Students at the University of Technology, Mauritius

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Abstract

The COVID-19 pandemic has threatened much of the world-operational activities including that of higher education. There has been a global shift with minimal notice from the traditional classroom to online teaching and learning via digital platforms. The paper aims at evaluating the attitudes and behaviours of the social science students having as objectives to firstly identify the challenges' students are facing with online learning amidst the COVID-19 pandemic and secondly explore appropriate measures that can be adopted towards improving students' learning and improve their engagement during the online learning sessions. The sudden transition to online and distance-learning resulted in lack of preparedness of students, teachers and at the institutional level. Furthermore, with the pandemic resulting in lockdown, many students have been dealing with stressful situations, mentally, financially or at-family level. Professionals from the teaching field have been looking into various approaches to have learning continuity with their students. Hence, this study is expected to contribute to the ongoing challenges and opportunities faced by the need to shift traditional classroom teaching to a blended learning mode. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) are used to map out the factors influencing the attitudes of the targeted students towards the new learning environment. Research methodology includes an e-survey instrument to collect data from students regarding their attitudes and behaviours with regard to their online learning classes. In addition, a focus group was conducted with some students from different social science fields of study to gain an insight into their attitudes and behaviours. This study has uncovered critical factors that the University of Technology, Mauritius should consider while adapting to the new normal of teaching and learning with effective support to students in achieving the learning outcomes of the programme of study. Moreover, the study has shed light on the difficulties and realities that students may encounter while shifting to this new mode of learning.

Keywords: Online Learning, COVID-19 Pandemic, Mauritius

Introduction

The COVID-19 pandemic has shaken the globe and its operational activities. The spread of this virus has led to the closure of educational institutions all over the world accelerating the shift to

online learning environments so that learning would not be disrupted. Since the beginning of the pandemic, nearly 90% of the world's student population, accounting for around 1.7 billion students in 195 countries were deprived of physical classrooms as they were unable to go to school or university (UNESCO, 2020 and European Data Portal, 2020). This outbreak disrupted the daily learning process and everyday routine of the most vulnerable and governments looked out for means for continuous studies whether school or at home, online or offline (Miks and McIlwaine, 2020). Furthermore, with the pandemic resulting in lockdown, many students have been dealing with stressful situations, mentally, financially or at family level. Professionals from the teaching field have experimented with various educational applications, platforms and resources to have learning continuity with their students ensuring social care and interaction during periods of school closure (UNESCO, 2020). The coronavirus pandemic has tested the readiness of institutions, teachers and students to deal with a crisis that requires online and remote measures. There has been a sudden, massive and unprecedented shift from the classroom to remote teaching and learning on digital platforms worldwide with minimal notice.

Even though confinement has been eased out in many regions of the world including Mauritius, it is important to review and assess students' response towards online learning which would eventually be integrated with the traditional face to face learning even beyond the pandemic. This paper aims at evaluating the attitudes and behaviours of the social science students at university level with the objectives to firstly explore ways to identify the challenges they have been facing with online learning during the COVID-19 pandemic and secondly to identify suitable and sustainable approaches to be adopted towards improving their learning online. There is a need to engage students online with the aim to ensure their learning continuity. Hence, this study is expected to contribute to the ongoing challenges and opportunities faced by the need to shift traditional classroom teaching to a blended learning mode.

The study adopts a mixed methodology, by carrying out an e-survey to collect data from students regarding their attitudes with regard to their online learning classes. In addition, a focus group was conducted with some students from different social science fields of study to gain insights into their attitudes and behaviours. This study is expected to unveil important factors that the University of Technology, Mauritius should consider while adapting to the new normal of delivering lectures and supporting students in achieving the learning outcomes of the programme of study. In Mauritius, we still have a pocket of families who are deprived of the minimum connectivity and equipment and tools to use for online learning. Thus, the study would also evaluate the difficulties and realities that students may encounter while shifting to this new mode of learning.

Overview of Literature

Online learning can be defined as a "learning experience in synchronous or asynchronous environments using different devices (e.g., mobile phones, laptops, etc.) with internet access. In these environments, students can be anywhere (independent) to learn and interact with instructors and other students" (Singh and Thurman, 2019). Interestingly, Barrett et *al*. (2016)

discussed the design of educational infrastructure which influence learning through three interlinked factors namely firstly naturalness such as light and air quality, secondly individualization such as flexibility of the learning environment, and thirdly stimulation namely color. Basilaia *et al.,* (2020) point out the advantages of e-learning experience based on administering large numbers of students in classes, live discussions, good connectivity, teachers' accessibility through mobile phones, recorded lessons to be watched afterwards, and immediate students' feedback. In such challenging times, the successful critical factor depends on how educational institutions adapt online teaching in a massive manner (Carey, 2020). Further, studies have found that if there is active learning by students in online classes, the learning process is enhanced (Benek-Rivera and Matthews, 2004). The new technologies and web-based activities are more interactive, coursework given online may create an environment where students find themselves with situations where they are actively engaged with material and learn, refine what they understand as they build their own knowledge (Johnston et *al.*, 2005)**.**

The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) map out the factors influencing the attitudes and behaviors of the targeted students towards the new learning environment. In TAM, perceived usefulness is defined as *"the degree to which a person believes that using a particular system would enhance his or her job performance"* (Davis, 1989). The theory illustrates how Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) affect people's computer acceptance behaviors and their attitudes. Computer usage is determined by behavioral intentions, which is jointly determined by the attitudes using Perceived Usefulness (PU) (Davis et *al.,* 1989). Venkatesh et *al.* (2003) had brought forth the Unified Theory of Acceptance and Use of Technology (UTAUT) comprising of performance expectancy, effort expectancy, social influence and facilitating conditions as four main determinants of behavioural intention and ultimately behaviour which are further determined by gender, age, experience, and voluntariness of use.

The pandemic has unfolded emerging educational needs and responses. Reimers et *al.* (2020) categorise the distance learning solutions in broad categories including curriculum and professional development and the usage of appropriate tools. Curriculum and Professional Development are resources which can support teachers or parents in supporting learners, guiding them to content, developing their skills to teach remotely, or more generally augmenting their capacity to support learners learning more independently and at home, rather than at school. These encompass lessons, videos, interactive learning modules and any other resources. Massive Open Online Courses (MOOCS) platforms as well as self-directed learning content providing adaptive online learning systems, lesson plans, conversation starters and personalised education content were widely used in the times of COVID-19 pandemic in order to support lifelong learning and professional development. For instance, in China, the Zhejiang University moved to more than 5,000 courses online in two weeks' time using the platform "DingTalk ZJU". Further, China is making use of three forms of online learning, namely MOOCs which take place on platforms like XuetangX and Icourse, Online real time interactive teaching (ORIT) and video teaching (Dunrong and Jin, 2020). Teachers in France mostly used the ZOOM software due to its user-friendliness. They also made use of their universities' digital platforms due to their different e-learning options. Moreover, many existing courses were made available on the "France

Université Numérique (FUN)" platform offering MOOC both at national and international levels. Moreover, they use WhatsApp, email, audio and video techniques. These new teaching practices were easily adopted by the majority of learners (Jocard, 2020). However, according to Clausen et *al.* (2020), while there has been considerable focus on preparing content, access to devices, and connectivity, less attention has been paid to how professional development is preparing teachers to improve communication between the school, teachers, students and families.

Tools facilitating teaching and learning include digital learning management systems (LMS) allowing teachers, parents or students to access educational content. These LMS allow teachers to connect with students and parents to build and manage classroom communities facilitating learning, grading, collaboration and assessment. Access remained the biggest challenge with nearly half of the learners not being able to access the distance education during the pandemic thus exacerbating the education divide in many parts of the world (UNESCO, 2020) including developed economies. For example, the USA faced significant inequalities in engagement with online learning resources based on family income, race and rurality (Bacher Hicks et *al.*, 2020). Another critical success factor for the adoption of online learning is the preparedness of students in using LMS platforms (Parkesa et *al.*, 2015). However, one of the challenges faced while moving abruptly to online learning was that the majority students had minimal experience using online classroom platforms. Thus, the quality of the learning experience highly depended on the leniency and patience in providing students with instructions and guidance for navigating the peculiarities of learning platforms.

Disparities in engagement in online learning are particularly acute in low-income countries with more than 80% percent of students in Sub-Saharan Africa not having access to household computers or lacking internet access disrupting the educational continuity. The University of Ghana has reviewed their strategy by training its lecturers to conduct online classes and have been granted free internet data. They use the Sakai online platform to support teaching, research and collaboration (Mohammed, 2020). Other services such as Google classroom, WhatsApp, Youtube and Zoom are also being used. However, these online learning are not available to all, especially to the poor people in the North of Ghana (Mohammed, 2020). From the Global Partnership for Education (GPE) funding, the government of Rwanda benefitted from US$10 million to ensure continuous learning during the lockdown and support the preparation of the reopening of the institutions as soon as the virus is under control (Dhar, 2020). Furthermore, the Open University of Sudan implemented an online support initiative using online synchronous and asynchronous teaching materials for the students along with TV channels and educational radio. The students were also provided free access to all mobile phone networks (Sawahel, 2020). Applications with strong offline functionalities and systems built for use on basic mobile phones emerge as sustainable solutions for students in remote areas with limited access.

Research Methodology

The study adopts a mixed methodology, by carrying out an e-survey to collect data from students regarding their attitudes with regard to their online learning classes. In addition, a focus group was conducted with some students from different social science fields of study to gain insights into their attitudes and behaviours towards online learning. For this study and given the time constraints imposed by COVID-19 only students of the School of Business Management and Finance have been selected as the unit of analysis. Given the different courses offered by the School and the heterogeneous nature of the social science students, we expect to have a good representation of the students' population.

The sample frame is derived from the semester timetable for the academic year 2020/21 and includes both undergraduate and graduate students enrolling on both full time and part time study. A total of 400 students were targeted for the survey. The age group of the students includes students in their early 20s and those in the mid-20s; 30s and 40s. Their programmes of study encompass the field of accounting, banking, investment and finance; general management, marketing, logistics, law and human resource management. The link to the google forms was sent to the different cohorts of full time and part time students. As such the sampling techniques are more of a purposive and judgmental approach.

In line with the theme of the study, the data collection was solely conducted online using Google forms except for the qualitative part of the study. One to two students per programme of study was selected to gain some rich data as regards this sudden change in the learning environment of the students. In total 10 students took part in the physical face to face focus group when the university resumed its courses after the lockdown period. To ensure consistency in the approach to the collection of qualitative data semi-structured questions (appendix 2) were prepared which include the learning environment at home, technical infrastructure, positive experiences from the usage of e-learning strategies, difficulties from the usage of e-learning strategies of various subjects learnt online, teachers/parents/peers as support system.

Data Analysis and Discussions

The number of responses by mid August was 145 students and this low response rate of 36% is mainly due to the programme of study being extended and students are busy working on the different components of the 100% coursework. Furthermore, after lockdown, the university continued its semester based on a blended learning mode to cope with the new normal. 10 students studying management (specialization in Law and General) were called in a physical face to face focus group (FG) to share their experiences of online learning during lockdown. Given the study objectives the analysis part is descriptive in nature and the survey results have been validated from the insights gained through the qualitative study. This in itself had added credence to the survey findings.

Profile of Students

Table 1 gives the students' profile on account of gender, course enrolled on, year of study, mode and field of study. The majority of the sampled students is undergraduate studying full time and is mostly following courses in accounting, banking and finance and management. Nearly 70% of the students are female and are reflective of the student population enrolled at the University of Technology, Mauritius. The age group of the students mirrors the full time students who are school leavers and they are in their early 20s. Our part time courses have suffered most during the COVID-19 due to work pressure after the lockdown period and represent a small share of the respondents. Most of the responses came from students who are enrolled in Year 1 and Year 3 of the programmes. As regards the field of study there is more or less an equal distribution of management students and students studying accounting, banking and finance.

Table 1: Profile of Students

Variables	Attributes	Frequency	Percentage
Gender	Male	44	30.3
	Female	101	**69.7**
Age Group	18 – 22	102	**70.3**
	23 – 27	22	15.2
	28 – 33	9	6.2
	Above 33	12	8.3
Mode of Study	Full Time	116	**80**
	Part Time	29	20
Field of Study	Accounting and Finance	56	38.6
	Banking and Investment	12	8.3
	Management and HRM	77	**53.1**
Level of Programme	UG: Year 1	42	29.0
	Year 2	28	19.3
	Year 3	53	**36.6**
	PG	22	15.1

Online Learning Experience

Prior to exploring the students' experiences and behaviours to the sudden shift to online learning, the survey first attempted to see if students have previously experienced any forms of online learning. Surprisingly some 65% students have such exposure which is expected as students do make use of online platforms for their self- learning, such as youtube channels and online presentations through Google Docs. The frequency of online learning during the lockdown period is displayed in Figure 1.
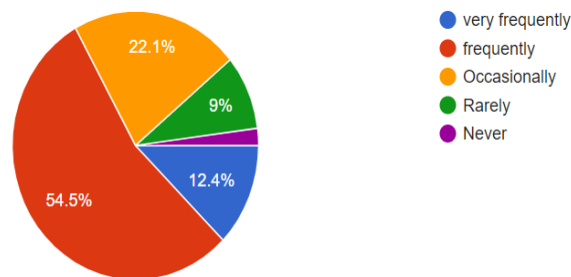
Figure 1: Frequency of online learning

A good 57% of the students were exposed to some forms of online learning and another 22% only occasionally. The tools they were exposed for their online learning are shown in Figure 2 below:
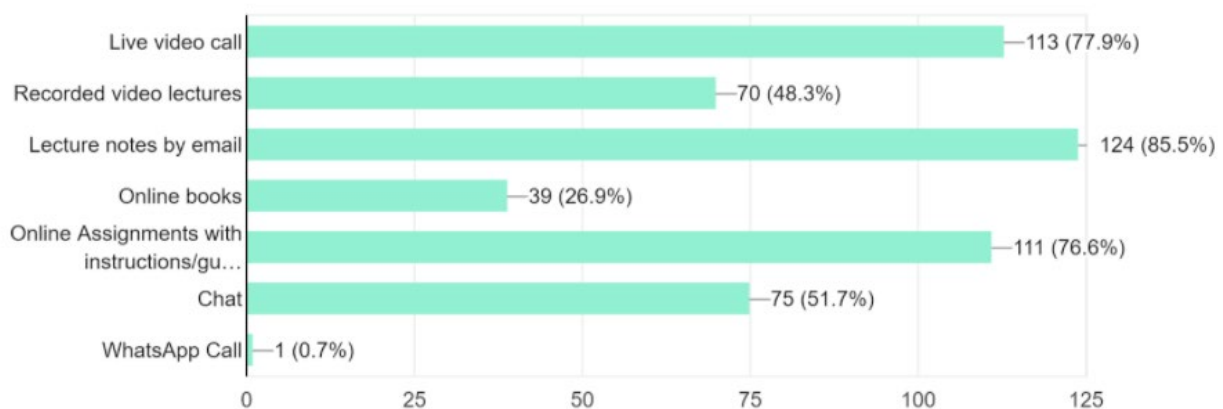
Figure 2: Online learning tools

As expected, the most used approaches to reach out to students during the lockdown were through email, followed by live video call and online assignments with instructions and guidelines. Students were also exposed to recorded video lectures and online books. The most commonly used asynchronous tool by lecturers at the very outset of the COVID-19 outbreak was email with instructions provided online and it is only through peers' advice that lecturers start becoming accustomed with the other tools that could be used to deliver lectures and support students. For synchronous learning, real time video "scheduled as per university timetable" according to students, have been used by more than 75% of the respondents. It is observed that the asynchronous delivery of lectures through video recordings were less widely used than the real time version as the latter leads to direct interaction with the students (Singh and Thurman, 2019). The adoption of a mixed of synchronous and asynchronous tools as a response to the

delivery of lectures have been appreciated by students, in line with Reimers et *al.* (2020). In fact, as per the focus group discussions, students found teachers were 'understanding', 'cooperative', 'supportive', 'hard working', and 'responsive'. Classes were interactive through discussions, questions and answers through chat sessions as well as short breaks were given.
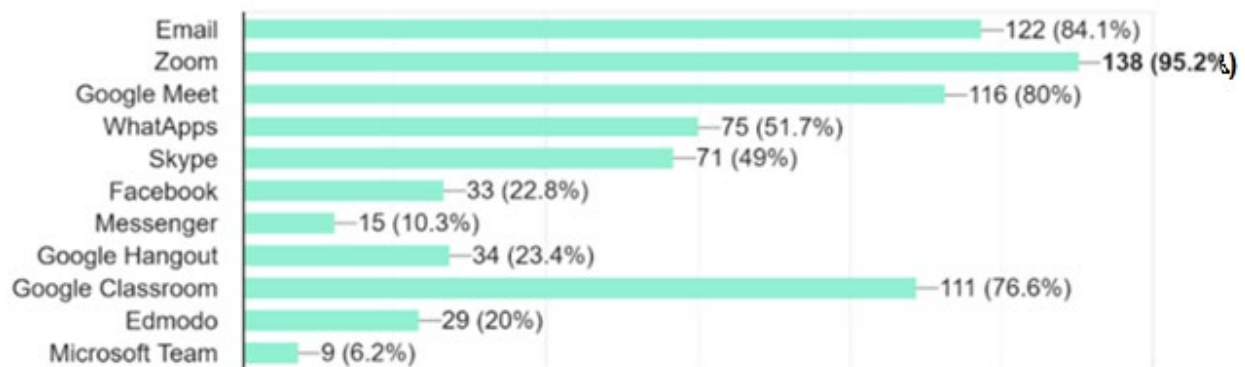
Figure 3: Most common used Tools

Furthermore, Figure 3 above displays the most common tools used during students' online learning experiences. Zoom and Google meet were mostly used as a mode for synchronous learning and Google Classroom was popular for asynchronous mode of learning for students to access learning materials and resources at their own pace. Of interest to note that WhatsApp and Skype were also used as tools for facilitating communication and learning between students and teachers. This observation is in line with studies from Johnston, Killion and Omomen, (2005) and Jocard (2020) stipulating relative easiness in adopting the different technologies and distance learning solutions. The focus group discussions further revealed that Google meet was more preferred than Zoom as "there is no limit on call duration." Furthermore, software applications such as Apache Openoffice and Microsoft Edge made it easier to open lecture notes. The different tools enhanced peer interaction, where students continued collaborative group work on assignments mostly via whatsApp and Messenger.

ICT Devices and Study Environment
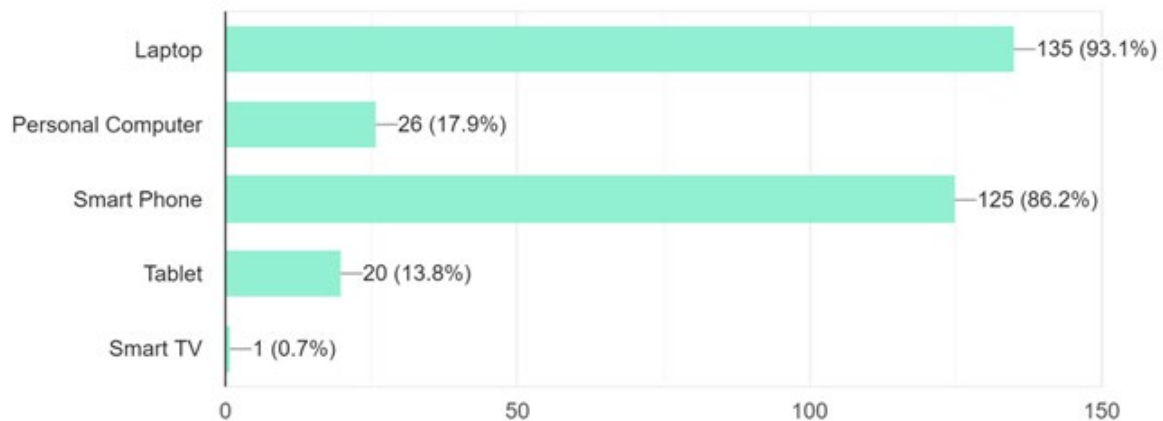
Figure 4: ICT Devices

ICT devices are much present in the Mauritian population and the survey results confirm such a tendency where laptop and smartphones are the two most used devices to access ICT products and services. A good number (72%) of the students claimed that they have a dedicated study room. This in itself is indicative of the Mauritian family where education of children is a priority. Such facilities are a prerequisite for students to embrace a blended learning environment. The response for internet connectivity is 98.6%. The large majority of students were equipped with their laptop, smart phone, printer, reliable broadband and Wi-Fi connection, Bluetooth, and cloud computing storage for them to be able to study at home online during the pandemic. Touch screen facilities made it more practical to switch between platforms, which are the main reason why they use mobile phones instead of laptops to follow online classes. The findings tend to concur with studies (for example UNESCO, 2020) emphasizing on the importance to use distance learning solutions compatible with basic mobile phones.

Facilitating conditions in the form of a conducive learning environment is an enhancing factor in the adoption of technologies according to Venkatesh et *al.* (2003) The students described their home learning environment as 'really cool', 'quiet space for study', 'home with better air condition than the university', 'peaceful', 'less tiring', 'less disturbances', 'comfortable', 'tidy study space', 'convenient', 'learn best at home'. Most of them had their own room converted to their learning space. One student uses scents on her study desk to uplift her mood to study. There is much preference for learning independence at home where they could eat and drink freely. Yet, one student reported that a negative experience for learning at home due to road noises, tumult related to building construction of neighbors, her little sister hanging around and sharing the family laptop with her brother who also had to attend online classes. Other distractors were television, mobile phone, social media, and even food. These findings confirm the descriptive results pertaining to the study environment

Effort expectancy and parental influence are critical in the smooth adoption of distance learning tools and approaches (Venkatesh et *al.*, 2003). Students whose parents are knowledgeable about

their field of study add credence to this transition; that is from a classroom lecture to an online learning environment. Some 38% of the respondents' parents are knowledgeable and 44% are ICT literate, which is also another important factor to help students cope with this transition. These preconditions have eased the difficulties for students to shift to online learning as some students have obtained guidance from their parents and siblings.

Benefits of Online Learning

The benefits experienced by students to this new mode of learning are categorised as regular in lecture, more time for self-learning and better organisation of time for personal growth activities. No travel, no stress to arrive late in lecture, yet students prefer to have F2F lectures to facilitate the interaction with peers and lecturers. Of note, working students who study part-time prefer the online mode of learning as this allows for more flexibility and no need to rush from work to attend lecture. Students have also viewed this sudden change as an opportunity for them to learn new learning strategies and modes of learning. They are particularly happy about the idea of being exposed to digital skills and in particular the use of the Google Classroom for uploading assignments and post to their lecturers. One such quote is of interest - "Despite assignments being much more difficult, I got the chance to explore and develop more time for online searching, rather than doing the assignments in limited ways". The positive experiences collected through the FG are summarized and listed as (1) promoting active and independent learning, (2) save transport cost, (3) reduce printing costs (4) save time, (5) avoid impulsive buying, (6) less tiresome, (7) improve digital literacy towards becoming effective to communicate with peers/lecturers, (8) relax environment with own space and comfort zone, (9) no pressure imposed by lecturers, (10) gets more study concentration, (11) more friendly and convenient time schedules, (12) recorded classes can be viewed again, (13) flexibility and accessibility of learning mode at any-time and from everywhere, (14) opportunity to learn online platforms for future working environment, (15) accessibility of the lessons 24/7, (16) self-paced learning, (17) sharing of YouTube videos by lecturers related to learning topics, (18) possibility of students contacting lecturers for more clarifications. The above findings align with the studies of Sun and Chen (2016), Basilaia et *al.* (2020) advocating efficiency, flexibility and accessibility as the benefits of online learning.

Barriers to Online Learning

Despite the fact that the internet penetration in Mauritius is high, yet there are issues with regard to good connectivity and bandwidth. This has come up as a main inconvenience for synchronous communication between the learners and the facilitators. Some 67% of the sampled students reported that they have problems with the internet connection which compromise partly their online learning experience. Work and family related commitments were not a major constraint to online learning, but this being so as the large majority of the respondents are full time students. However, constant disturbances at home and within the neighbouring vicinity were a major hindrance to online learning and this being the case as Mauritian students live with their family unlike their European counterparts. "The only benefit is that not stuck in traffic but nevertheless face to face class is vital. Online classes we can barely interact and ask more

questions and no proper communication. Somehow distracted by many things at home". Further one student put forth that "With some lecturers, it was kind of very artificial learning; they were not able to interact with students. Students cannot clear their queries whenever they feel the need, but they have to wait until the end. If we do not understand something in the beginning then how are we going to understand the whole topic which the lecturer kept explaining".

The insights from the focus group have uncovered the following difficulties (1) poor internet connection, (2) no power at home or power cut, (3) smartphone breakdown, (4) students poor knowledge on how to use web based programs for e-learning, (5) one teacher using only emails for communication with students, (6) different lecturers chose different e-learning platforms and students had to adapt through different platforms, (7) Zoom free application had a limit 40 minutes and new link to be sent again, (8) boredom and less motivation due to lack of face to face interaction, (9) students tend to lose focus after a shorter time period, (10) online background noises, (11) use of LMS by lectures whereby screens presented were frozen, (12) student hesitation in asking for clarification since there was no physical face to face class sessions were conducted prior to lockdown, (13) lack of training in IT Skills for students create technical difficulties namely assignment submission, accessing program, use Excel (14) overloaded with assignments with no time to spend with family. As such, some of these findings from the FG are in line with studies of UNESCO (2020), Carey (2020), and Parkesa et *al.* (2015) stipulating that e-learning is dependent on each student's dominant learning style and may in fact exacerbate the gap and divide in education. Furthermore, technological issues remain a barrier in the smooth running of online learning while focus deficit and reduced interaction hindered the online learning experience aligning with findings from Sawahel (2020) Nguyen and Pham (2020), Mohammad (2020) amongst others. Despite the constraints faced within the family unit, students have tended to disagree with the statement that "The learning environment at home is not conducive for learning online". This being the case as the benefits gained from online learning outweighs the barriers, which were viewed as temporary in nature.

Concluding Remarks

The COVID-19 pandemic has forced the educational sector to rethink its teaching methodologies and strategies. The days of whiteboards within the four walls are gone. Consequently, universities are faced with the reality of embracing digital tools for students learning. Unlike the traditional face to face and board method of teaching, online learning has eased the learning process during the lockdown for a learning continuity of learners. Despite the different challenges with e-learning, there are many positive experiences while adopting the e-learning strategies. The difficulties can be overcome if necessary measures are taken for the benefit of all learners. The education sector is being triggered to review and be more prepared for such future calamities. By having face to face teaching, individual communication and relations will still exist between the lecturers and students while with online teaching, it might be a good experience for the learners to prepare them for the future working environment and develop more their capabilities and skills. Furthermore, universities need to train academic, non-academic staff as well as students towards the online learning strategy. The challenges to cope with the new normal are

being partly addressed and it is expected that the University of Technology, Mauritius would move to blended learning mode as from the next semester.

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IT Tools and Technologies for Examination & Assessment

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Abstract

To address the challenge of remote learning, a number of initiatives have been taken to assist students, scholars, teachers and lifelong learners in their studies. These initiatives cover educational requirements of learners at all levels - e-Learning Infrastructure and e-contents; Teaching through TV channels; MOOCS for open schools and pre-service education; Teaching through radio; E-Textbooks; and Repository of open educational resources

Similarly, many IT initiatives have been taken in the area of examination assessment. There is a paradigm shift in the examination system where more and more IT tools and technologies are being adopted by various examinations. This is happening primarily due to various issues pertaining to the sanctity of the traditional system of examination with challenges of integrity and effectiveness. The brief about few of them which I have developed as well as implemented in my organization are Computer Based Test (CBT); Digi Scoring - Strengthening of Competitive Examination System; Digital marking/On Screen Marking of answer books (OSM); Online Encrypted Question Paper Delivery System; CMTM– Confidential Material Tracking & Monitoring Apps; TETrA : Theory Evaluation Trend Analysis; Outlier System

Keywords: CBT, OEQPD, TETRA, OSM, OUTLIER, CMTM, DIGI SCORING

Introduction

Achieving inclusive and quality education for all reaffirms the belief that education is one of the most powerful and proven vehicles for sustainable development. This goal ensures that all girls and boys complete free primary and secondary schooling by 2030. It also aims to provide equal access to affordable vocational training, to eliminate gender and wealth disparities, and achieve universal access to a quality higher education.

Quality education means – quality curriculum, quality teachers, quality teaching learning process, quality examination and quality assessment. The Central Board of Secondary Education, Ministry of Education, Govt of India is determined to ensure quality education in all institutions associated and affiliated with it.

The Central Board of Secondary Education is the national board of India which works under overall control of the Ministry of Education (Earlier Ministry of HRD), Govt of India. It has approximately 24,000 schools and 20 million students across India and 25 other countries. Every

year the board conducts examinations for approximately 15 million examinees including grade 10, grade 12 and other competitive examinations. The main mandate of CBSE is:

1. To conduct examinations for secondary schools and senior secondary schools.
2. To conduct other examinations, including competitive and recruitment, as may be determined or assigned to it by the Central Government.
3. To develop and manage quality and standards in school education.
4. To grant affiliation to such schools and other educational institutions in India or outside India which propose to prepare their students and candidates for the examinations conducted by the board.
5. To undertake continuous professional development of teachers and organize such activities or training as are considered necessary for development and promotion of child-centric education.

The Central Board of Secondary Education is a state-of-art technology driven, e-governed, m-governed, digitally empowered and highly efficient educational organization of international repute, having global outreach with maximum transparency, increased accuracy, greater accountability and high responsiveness in the successful functioning of all its domains such as academics, examinations, affiliation and administration.

To address the challenge of remote learning, several initiatives have been taken to assist students, scholars, teachers and lifelong learners in their studies. These initiatives cover educational requirements of learners at all levels:

1. e-Learning Infrastructure and e-contents
2. Teaching through TV channels
3. MOOCS for open schools and pre-service education
4. Teaching through radio
5. E-Textbooks
6. Repository of open educational resources

Similarly, many IT initiatives have been taken in examination assessment. All examination related activities in CBSE are now IT enabled. There is a paradigm shift in the examination system where more and more IT tools and technologies are being adopted in various examinations. This is happening primarily due to various issues pertaining to the sanctity of the traditional system of examination with challenges of integrity and effectiveness. A few tools addressing such issues have been conceptualised, developed and implemented in our organisation and have been discussed in this paper.

Related work

Before the advent of the twenty-first century it was well established that if the examination process using computers is carried out properly it is equivalent to pen-and-paper tests or could even be better [1]. With advancement of technology on an exponential scale, it became easy to carry out examination related processes online, but with it came other challenges in security,

data integrity, confidentiality, availability, and accessibility. Hun et al. in [2] have covered the social and professional domains in coming up with successful exam tactics. Various aspects of examination grading - delivery, assessment, marking, review, and return - have been discussed in [3] by Noonan, but no discussion regarding subjective answers grading and security of confidential material has been made. Bloomfield discussed well in [4] a software to grade exam papers digitally but security of the process or analysing anomalies in the results were not addressed. Understanding that there are many other issues which come with use of technology for something as crucial as national-level examinations, CBSE came up with many IT tools to address them.

IT Tools and methods

Computer Based Test (CBT)

About

e-Assessment, computer-based test, or as we call it, online assessment, is believed to be a technique for a quicker, safer, and more transparent assessment. With the evolution of the education system, the method of assessment also needs to evolve with it. Use of technology, hence, seems to be a probable solution for this problem. e-Assessment has improved with the access to Internet and technology, which are used for the same. Also, with further improvement in various online applications and software, the procedure of assessment will be able to get completed more efficiently.

CBT, as a tool and technique, is being adopted by examination conducting bodies across the globe, particularly for competitive examinations where the assessment is largely multiple-choice questions (MCQ) type. We pioneered to introduce CBT in our organization. The system has evolved over a period of time due to advancement in technologies and techniques, the process of which is discussed in the next section.

Process flow
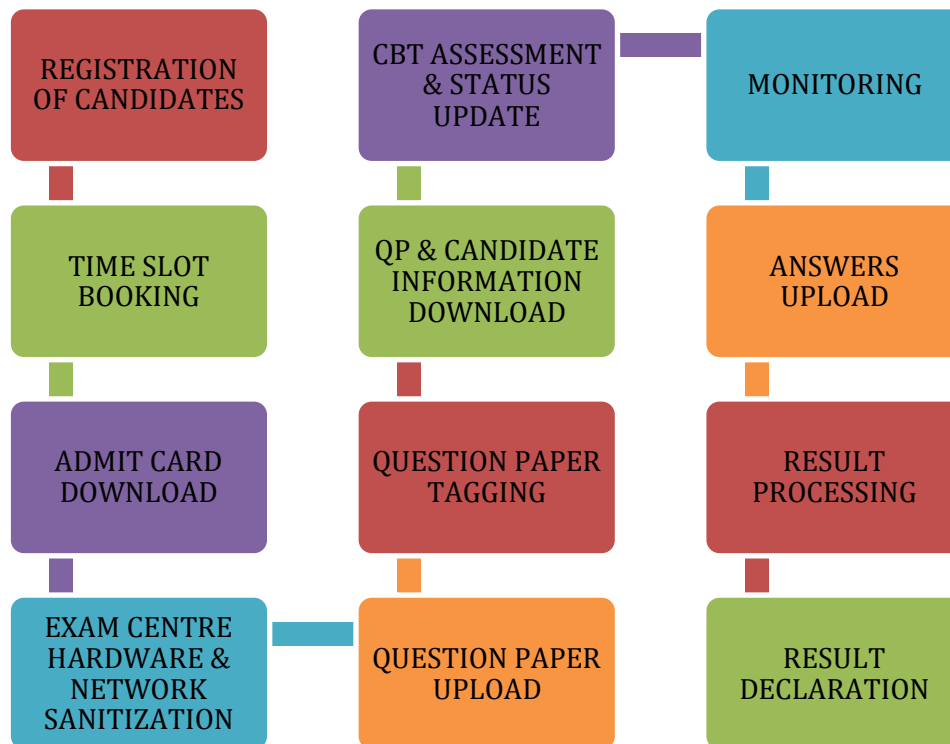
Figure 1: Process flow of CBT

Figure 1 is a simplified diagram for the CBT process implemented in CBSE. Candidates are registered online and are allowed to book a time-slot for themselves for the examination. Once their registration is verified, they can download their admit card. Meanwhile, infrastructure at the exam centres are sanitised and prepared for the exams. Before every exam, question papers are uploaded and tagged with unique IDs. Question papers and candidate information can then be downloaded at the exam centres. During the exam, exam centres update the status (regarding the on-going exams) and monitor the process. After the exam, answer sheets of the students are uploaded and results are processed (then declared) using other tools by CBSE.

Security at various modules

One of the greater challenges that CBT faces is the ability to operate in a secure environment. Listed below are some of the steps that are taken at various stages of the process to mitigate such challenges.

Examination Server
- ☐ Standard Operating Environment (SOE)
- ☐ Whitelisting of Servers
- ☐ Date and Time hardening of servers

Candidate System/Console/Node
- ☐ Custom Operating System

☐ Operating System Launcher Software
☐ Port Blocking
☐ Dynamic Internet checking
☐ Detection of Virtualized Environment
☐ Detection of Additional Hardware

Drive Commencement
☐ System Access Password (SAP)
☐ Drive Credentials (DC)
☐ Question Paper Access Password (QAP)
☐ Drive Commencement Password (DCP)

Data Security
☐ 256-bit encryption for Question Paper
☐ 128-bit encryption for Results
☐ Cryptographic Hash Function (MD5)
☐ RSA Algorithm based results processing

User Security
☐ Unique login credentials
☐ Audit Log
☐ Verification of Admit Card Photo
☐ Verification of Original ID Proof
☐ Photo and Biometric capture
☐ Candidate to System Binding
☐ Face Verification

Content Security
☐ Content Authoring Engine (CAE)
☐ QP creation in Institution Premises
☐ Multiple Authentication
☐ 256-bit encrypted QP Bundle

Features and advantages

CBT has now become a need of the time. With ever increasing rise in the volume of students, it calls for a robust methodology of conducting examinations in a safe, secure and error free manner.

CBT offers several improvements from an examination integrity point of view. Examinations can now be proctored in person in addition to being smart-proctored as well. CBT presents a robust system with extra ordinary security features at every stage. Question paper (QP) bundle preparation comes with AES 256-bit encryption. Additionally, encrypted QP are transferred to a central server through a Virtual Private Network (VPN). Password transmission is done separately

via an encrypted M-to-M channel. An exclusive operating system is used to prevent any type of remote access or penetration.

CBT offers candidates a slew of benefits as well. It makes online and PDF modes available to candidates. It allows easier access for candidates to test centers in the vicinity. CBT ensures that candidates have on time and defect free access to results along with a real-time test progress pallet.

From a logistical point of view, CBT provides 100% elimination of security risk throughout the exam life cycle, 100% elimination of logistics of QP and response sheets and 100% error-free result processing. It allows for a reduction in exam cycle time and real time monitoring of examination progress. It makes sifting through records easier by giving on-demand query responses.

CBT when coupled with other technologies like biometrics helps greatly to reduce fraud. Photo and biometric capture allow for a stricter enforcement of guidelines. This helps to identify unregistered candidates. Biometric verification, including choosing the impression of which finger is being captured, allows display of score (with appropriate color coding) during verification and verification report printout.

Digi Scoring

About

Worldwide several examinations are being conducted where Optical Mark Reader (OMR) answer sheets are being used to mark answers in mainly MCQ format. In the traditional system, once the exam is over, all OMR sheets are collected and brought to a centralised location, scanned, key implemented, and results are declared. The system is vulnerable as OMR sheets are transferred through many hands from one location to another. To strengthen the competitive examination system, Digi Scoring has been conceptualized, developed and implemented in CBSE.

Features

Digi Scoring makes use of computer vision technology. Soon after an exam, OMR answer sheets are scanned at exam centers, the same are uploaded on cloud from exam centers directly. Data capturing is done from the images uploaded on cloud using specially designed and developed image processing softwares. Images are converted into data. Data is processed, key implemented, and the result is processed.

This process quickens the entire process of declaration of results. It helps in the process of eliminating risk of tampering of OMR sheets, malpractices, loss of answer sheets etc. OMR answer sheets are secured as they are not exposed in physical form to multiple scanning and processing vendors or any third party.

Digital marking/On Screen Marking of answer books (OSM)

About

On Screen Marking (OSM) is a system for digitally marking of subjective type answer scripts. Summative online assessment is taking some time to be accepted by various examination conducting boards due to problems of authenticity, accessibility, and security of the answer sheets. OSM has made this problem diminish. In this system, the answer sheets of the students are scanned and made anonymous to the evaluators. These evaluators, situated at different locations, can check the answers online, and the final score is summed up by the computer. CBSE conceptualized and pioneered an implementation for evaluation of Grade 10 and 12 exam answer scripts.

Process
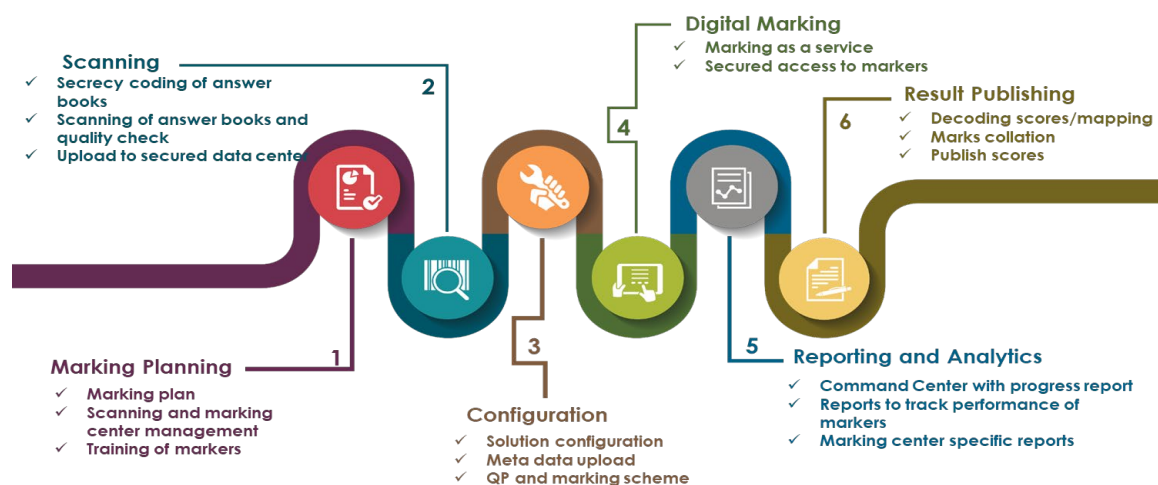
Figure 2: On screen marking - digital evaluation (Source: TCSION)

In brief, the process involves creating a marking plan, training of individuals who will do the marking (markers) and marking centre management related tasks as shown in Figure 2. Once these elements are in place, scanning is the next major step. Herewith, answer books are secretly coded and scanned. All these scans are uploaded to a secured data center. Following this a system configuration phase takes place. Solutions and configured for the question paper and a marking scheme is set. Meta data is also uploaded at this point.

At this point in the process, the actual marking of answers takes place with secure access being provided to markers. Reporting and Analytics help unlock the true potential of this system. Reports can be generated to track performance of markers along with marking centre specific reports.

This leads us to the final step where we publish results. We decode the scores, collate the marks, and finally publish the scores.

Features

One primary advantage of OSM is that evaluation of an answer script can also be done on multiple locations simultaneously. The answer scripts are coded, scanned and distributed through LAN to the examiners in nodal centres or the answer scripts are made available on remote locations. Use of the OSM software eliminates any variations due to evaluation location. This allows the use of a greater pool of digital markers than available locally. This also unlocks the potential of a simultaneous multi-marking process and configurable solution.

From a candidate's point of view, OSM improves the accuracy and efficiency of marking remarkably. It removes the doubt from the mind of students that some of their answers went unchecked or that their marks have been calculated wrongly. Additionally, OSM has an edge over the manual method as it reduces the margin of error in tabulation of marks providing 100% accuracy in marking. In addition, we have a 100% elimination of tampering with marks and a zero loss of answer books in transit.

Logistically, we eliminate Answer Books logistics and bring 100% automation in result processing. Support for on-demand queries is enabled allowing us to track the process with reports and dashboards. Also, a click by click audit trail is created to contest any discrepancies.

Looking to the future, with the help of Artificial Intelligence and Machine Learning (AI/ML) techniques, the subjective type assessment can also be done through machine only. We are in processes of implementation of AI/ML for subjective assessment to make it objective.

Online Encrypted Question Paper Delivery (OEQPD) System

About

Traditionally, question paper design, development, printing, and dispatch is a very cumbersome and challenging process. It involves a lot of risk. Therefore, a need for an alternate system was felt which was secure and hassle free. The Online Encrypted Question Paper Delivery (OEQPD) System was conceptualized, developed, and implemented in CBSE. A system for just in time creation and encryption of question papers, just in time dissemination, just in time decryption of encrypted question papers and just in time printing of question paper to prevent any possible chance of leakage. The process is tabulated in Figure 3.

| Generation | Storage | Transmission | Decryption | Printing |

QP life-cycle	Method 1	Method 2	Method 3	Method 4	Method 5
Generation	Prepared in advance by	Prepared in advance by	Auto-generated by	Auto generated by	By the Exam Centre

	Paper Setters	Paper Setters	Controller of Exam in his office	Controller of Exam in his office	Incharge at exam centre itself
Storage	Watermarked & Encrypted in USB hard disk	Watermarked & Encrypted in cloud	Watermarked & Encrypted in USB hard disk	Watermarked & Encrypted in cloud	Watermarked & Encrypted in cloud
Transmission	Physically	Not required	Physically	Not required	Not required
Decryption	At the exam centre – by the Exam Centre Incharge				
Printing	At the exam centre – by the Exam Centre Incharge				

Figure 3: Online Encrypted Question Paper Delivery Flow

Futuristic Exam Centres – Smart Exam Centres

The section lays down the requirements of a smart examination centre in terms of the infrastructure and other related requirements that we envision to be achievable in India.

Infrastructure

AC room of at least 15(ft) x15(ft) in size having proper electric/UPS/generator wiring and CCTV cameras. The room should preferably have smart doors (Electronic) having provision of opening through Biometric and restricted/authorized access. A locker for safe and secure storage of secondary media.

Hardware

- ☐ Desktops / Laptops (Minimum configuration I-5/I-7 with 8 GB RAM).
- ☐ Laser Printers (50-60 PPM each) with facility of duplex printing.
- ☐ Printers should have a facility of stapling. Alternatively, High Speed Photocopy machines the capability of stapling will also work.
- ☐ High speed data cards.

Software
Any OS and PDF reader.

Manpower

Duly qualified Programmers or Computer Teachers

Features and advantages

OEQPD allows for rule and blueprint based timely generation of question paper. Question papers are encrypted, watermarked, decrypted as per schedule. and disseminated in a planned manner. This allows for multiple question paper sets at multiple locations along with just in time printing of question paper to prevent any possible chance of leakage.

CMTM– Confidential Material Tracking & Monitoring Apps

About
Each and every step in the examination process is full of challenges. From safe delivery of question papers to custodian and from there to centres of examinations involves risk. This movement of question papers can be monitored through implementation of technology. The devices / locks can be planted which will be opened electronically same time from the centralized command centre. However, for everyday and for all functionary's movement of question papers need to be monitored. This can be done with the help of technology.   For electronic surveillance, tracking and monitoring of highly confidential and sensitive materials five different apps have been developed and implemented for Custodian of the confidential material, Examination Centre Incharge, Exam Body Representative, Administrator and Observers.

Features

CMTM allows for electronic surveillance, tracking and monitoring of highly confidential and sensitive materials by custodian of the material, centre incharge, representative, administrator, and observer through secure login. All above functionaries must click and upload pictures after

enabling GPS. The pictures uploaded are geo-tagged and time-tagged. These Apps allow tracking of all movements of confidential material in real time.

TETrA : Theory Evaluation Trend Analysis

About

During evaluation of answer scripts, it is important to closely monitor the entire evaluation process, because faulty or casual evaluation may be disastrous. In order to address this, TETrA was developed. Theory Evaluation Trend Analysis (TETrA), is a Decision Support System (DSS) portal for Real Time Evaluation Monitoring. It is an online system through which theory evaluation trend can be visualized, analysed, and monitored. This also generates various statistical data and gives graphical representation in real time.
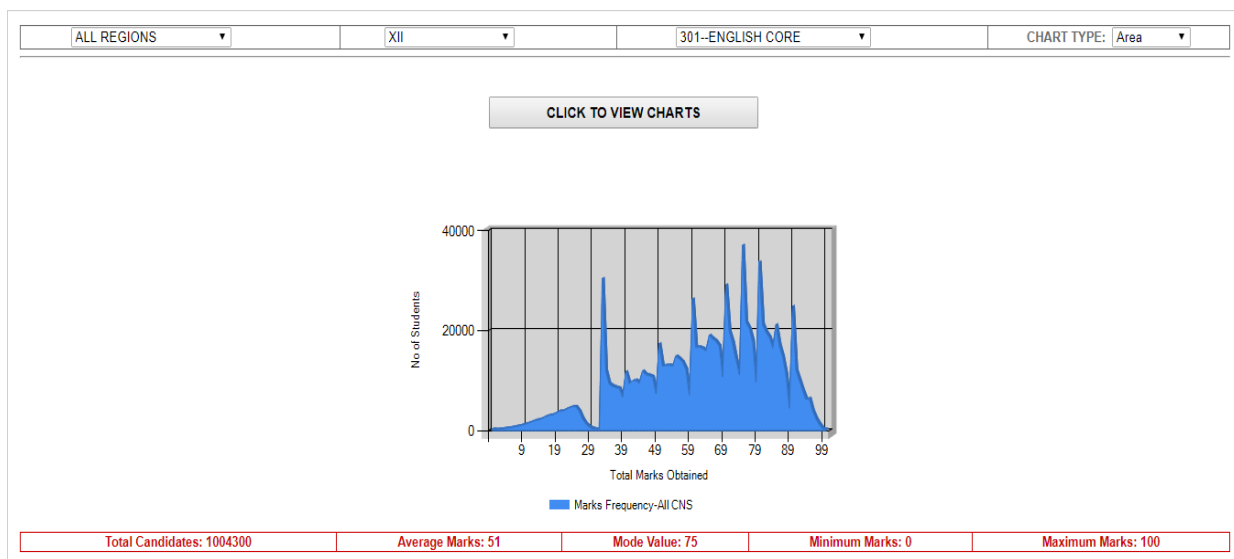
Figure 4: TETrA interface showing graph for number of students vs total marks obtained
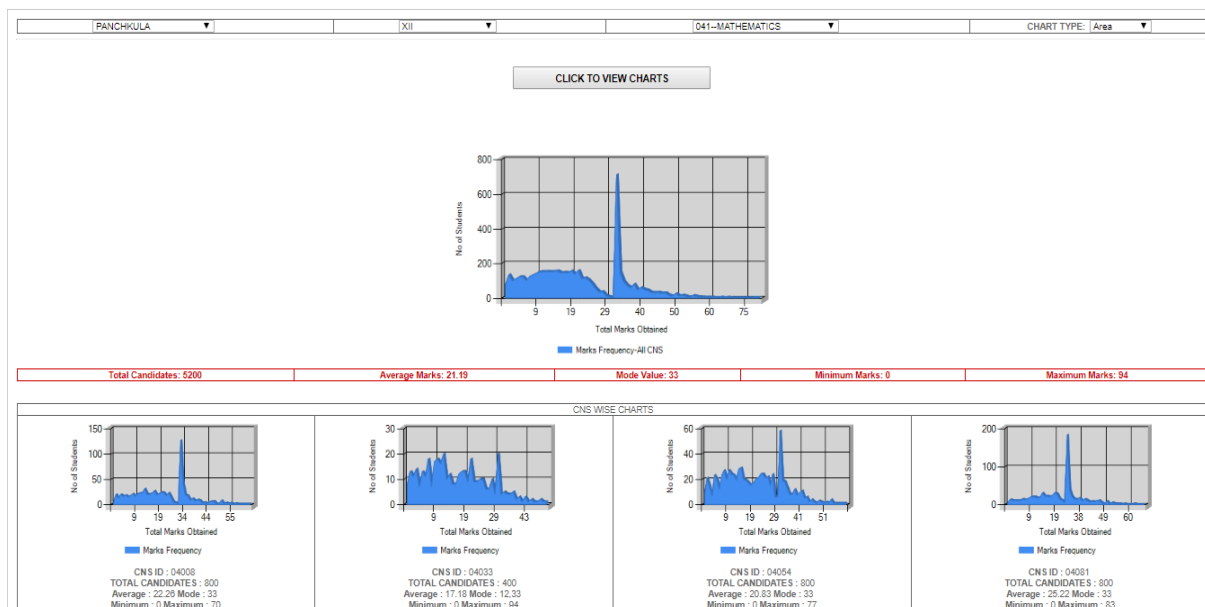
Figure 5: TETrA interface showing graphs as in Figure 4 for various exam centres

Features

Main feature of TETRA is the graphical representation of the evaluation trend in real time, as shown in Figure 4 and Figure 5. TETRA also provides a frequency versus marks curve for all the subjects spanning across all regions in India. It also provides various statistical data such as mean, mode and standard deviation. Total evaluated sheets, minimum, maximum marks scored and like can also be viewed through the software.

Due to availability of real time data of answer books to be evaluated and teachers to be deployed, this system also gives the projection of evaluation status and projected requirement of teachers to achieve the evaluation schedule based on goal-seeking analysis.

Outlier System

About

Conducting seamless examination is a challenge for examination conducting bodies throughout the world. However, accurate assessment is a much bigger challenge. The monitoring of evaluation should be done from day one using various tools and techniques. Despite best efforts by examination conducting bodies, vagaries in evaluation are bound to happen because of involvement of human element. So there is a strong need to develop a system which can detect inconsistency in marks or grades after result preparation and before its declaration as a last attempt to ensure error free declaration of results for all the examinees. For this purpose, a system has been developed and implemented which detects inconsistent marks cases which are outliers. These cases are re-checked before result declaration to enhance accuracy of results.

Features

The software developed finely detects inconsistent marks cases at pre-result declaration stage for checking. "Outlier System" helps in seeing any anomalies by observing the trends in the marks and any significant inconsistency is detected. Hence, it is a system which enhances accuracy of the result by working towards error free results.

Concluding remarks

The Central Board of Secondary Education has adopted several best practices, tools, techniques, and technologies, in the domain of examinations, few of which have been explained above. Globally, many examination bodies are employing various other state-or-art technologies in assessment and examination which have been discussed in the related works section. IT tools implemented by CBSE have helped in overcoming a lot of issues pertaining to examination systems when it comes to the 'CIA triad' of confidentiality, integrity, and availability. This has been done while keeping in mind the importance of time, generation of accurate results, and even post-processing the results to observe any trends or anomalies. This comes with reduction in cost of paper or similar amenities as well as convenience of examiners and examinees when it comes to the geographical locations of examination or evaluation centres. With processes made online and having established the required infrastructure in a lot of examination centres, we believe that we have made a significant contribution in accelerating India's growth in the domain of examinations.

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The Influence Of Service Quality And Institutional Image On Students' Satisfaction Among Undergraduates In Mauritius

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Abstract

The Mauritian Higher Education sector has been changing rapidly, and this has led to an increase in students' enrollment. Hence, students' satisfaction turned out to be an important goal for the Higher Education Institutions (HEIs) since satisfaction is a way to gain competitive advantage for these institutions. The purpose of this research is to explore the mediating role of Institutional Image between Service Quality Dimensions (SQD) and students' satisfaction. Moreover, it attempts to investigate the relationship between Service Quality and students' satisfaction. Data were collected through the administration of an online questionnaire using snowball-sampling procedure to obtain 400 responses from both private and public HEIs in Mauritius. However, only 384 questionnaires were used for all subsequent analysis using SPSS version 22. A descriptive analysis was conducted on the respondents' profile, while cross tabulation, chi square, correlation tests, linear as well as multiple regression analysis, and sobel's test were used to test the research hypotheses. The study established that there is a statistically significant relationship among SQD, Institutional Image, and students' satisfaction. The Sobel's test was conducted to establish the mediated relationship between SQD and Students' Satisfaction mediated by Institutional Image. The results of the study suggest that universities in Mauritius have to invest in reliability of service and institutional brand development since these two have great influence on the university publics. The research findings also indicate that today students require adequate IT related support and the interaction with the lecturers and administrative staff in shaping the quality of service in their institutions.

Keywords: Service Quality, Institutional Image, Student Satisfaction, Higher education, Mauritius

Introduction

Free higher education for undergraduate students is part of the government's higher education policy to diversify the local higher education market, and this has influenced a considerable growth in the demand for higher education in a short lapse of time. Therefore, the factors that allow Higher Education Institutions (HEIs) to attract students should be studied in order to gain competitive advantage in the future. HEIs are required to look for new and effective techniques to attract more students. Students' Satisfaction is considered as a key component to realise

customers' requirements into future consumption (Lai, Lou, Yusof, & Chew, 2011). Besides that, a satisfied customer will undoubtedly communicate the excellent experience to others, which is considered as a positive word of mouth. In other words, students who are disappointed have no other choice but to continue with their studies at the same institution in spite of the poor quality of the services provided.

Hence, under these conditions, the students may communicate their dissatisfaction using social media or any other medium, which would affect the HEI's reputation. Online evaluations through social media do influence a potential student's decision about enrolling in the university (Wong, Lee, & ML Ng, 2018) Therefore, the HEIs management should be apprised of the factors that can influence the Students' Satisfaction and understand how the latter can influence the HEIs.

Since students are considered as strategically important, investigating Students' Satisfaction has been the main interest of many researchers. To address this issue, the study aims at examining the relationship between Reliability, Tangibility, Responsiveness, Empathy, and Assurance factors, which are described as the SERVQUAL Model with the Students' Satisfaction. In addition, it attempts to investigate the mediating role of Institutional Image in the relationships between Service Quality Dimensions (SQDs) and Students' Satisfaction among undergraduate students.

Literature Review

Service Quality
Service quality in the field of higher education is crucial and important. According to Alves & Raposo (2010) good Service Quality (SQ) has a significant influence on Students' Satisfaction and thus a satisfied student would attract more students through word of mouth. Ahmed & Nawaz (2010) stated that SQ is vital in order to achieve educational excellence and is the key strategic element for HEIs to create a great impact in the mind of the consumer. Due to globalisation, a strong competitive environment exists among institutions in the Higher Education Sector and many HEIs are keen to study the factors that influence the decision-making process of potential students (Pedro, Mendes, & Lourenço, 2018).

Efficient and satisfying service to the students of the HEIs can enhance the institution's long-term corporate image since poor student enrollment may put in danger the competitive advantage of the HEIs. Therefore, it is imperative for HEIs to examine their SQ and to ascertain the requirements of students. According to Chatterjee, Ghosh, and Bandyopadhyay (2009) the SERVQUAL is a good measure for student evaluation, particularly for evaluating teaching effectiveness. Likewise, Yeo and Li (2014) revealed that the HEI's service directly affects the learning dynamics of the students.

This study applied the SERVQUAL model developed by Parasuraman, Zeithaml & Berry (1988) which comprises Reliability, Tangibility, Responsiveness, Empathy and Assurance given that it broadly determines SQ. From previous researches, it is concluded that SQ is a major construct in determining the II and CS (Fitri, Ilias, Abd Rahman, & Abd Razak, 2008; Danjuma & Rasli, 2012;

Ibrahim, Rahman & Yasin, 2014; Subrahmanyam & Bellamkonda, 2016). In the context, the following hypotheses are suggested:

H_1: There is a significant relationship between reliability and the Higher Education Institution's Service Quality

H_2: There is a significant relationship between tangibility and the Higher Education Institution's Service Quality

H_3: There is a significant relationship between responsiveness and the Higher Education Institution's Service Quality

H_4: There is a significant relationship between empathy and the Higher Education Institution's Service Quality

H_5: There is a significant relationship between assurance and the Higher Education Institution's Service Quality

Interaction of Constructs

An educational institution should emphasise on the Satisfaction of its customer that is the students and change its approach into student - oriented one (Kotler & McDougall, 1983). This means that HEIs SQ may relate with other constructs, such as Students' Satisfaction and Institutional Image. Brady and Cronin (2001) ascertained that Service Quality does interact with other constructs and hence, should focus on the results. This study adopted the SERVQUAL model of Parasuraman *et al.* (1988) with the five dynamics evaluating Service Quality in HEIs namely:

(1) Reliability indicated how trustworthy the higher educational services are considered by its students; (2) Tangibles covered all the physical amenities within the HEIs;

(3) Responsiveness involved how the higher educational services are promptly being offered to the students;

(4) Empathy dealt with the attitude of the HEIs in an attempt to handle the students when they face with problems, and

(5) Assurance included the Students' confidence level in the lecturers' knowledge, educational skills and general abilities.

Students' Satisfaction

SQ in higher education is the main antecedent of Students' Satisfaction, which means that a higher level of SQ is likely to increase the Students' Satisfaction. Thus, in a competitive Higher Education Sector, HEIs must attempt to constantly enhance their services they provide to the students so as to meet their expectations and requirements (Lee, 2013).

Satisfied students are likely to communicate positive word of mouth facts by revealing their good experience with others (Dutton & Dukerich, 2017). In other words, if students are satisfied with the SQ provided by a HEI, there is a great possibility of recommendations for that institution to prospective students who are planning for admission. Therefore, the following hypothesis has been formulated:

Hypothesis 6: There is a direct and positive influence of SQD on the Students' Satisfaction of the HEI.

Institutional Image

Alves and Raposo (2010) described Institutional Image as a basis of competition among HEIs. Image was recognised as a significant factor for a complete evaluation of an institution (Bitner, 1990) and is contended to be what comes to the mind of customers when they hear the name of an institution (Nguyen, 2006). Hence, Institutional Image is a significant factor in the overall evaluation of the service. Researchers have established that SQ affects Institutional Image (Lai, Griffin, & Babin, 2009; Nguyen & Leblanc, 2001) which consequently influences Customers' Satisfaction (Lai *et al.,* 2009; Ryu & Jang, 2008). This concept also applies to the Higher Education Sector where Alter and Reback (2014) established that there is a relationship between Institutional Image and the number of applicants. Considering that the Institutional Image is an important element for the overall competitiveness of an institution, this study attempts to establish relationships between Institutional Image and the other constructs such as SQD and Students' Satisfaction.

Hypothesis 7: There is a significant relationship between SQD and Institutional Image of the HEI.
Hypothesis 8: There is a significant relationship between Institutional Image and Students' Satisfaction of the HEI.

Mediation of Institutional Image between Service Quality and Students' Satisfaction

SQ is an important component for the institutions. Hence, the quality of the services is grounded on the capabilities of that institution to meet the needs and requests of its customers constantly (Parasuraman, *et al.,* 1988). Many researchers have revealed that SQ has a direct influence on Customer Satisfaction (Anderson & Sullivan, 1993; Cronin, Brady & Hult*,* 2000; Fornell, Johnson, Anderson, Cha, & Bryant, 1996; Lee, Lee, & Yoo, 2000; Parasuraman, *et al.,* 1985; Saravanan & Rao, 2007). On the other hand, Students' Satisfaction is the subjective condition through which the proposed products or services satisfy customers' expectations (Engel, Blackwell, & Miniard, 1995). However, if an HEI has a positive Institutional Image, it indicates that there is a high level of Customer Satisfaction. This is because the positive image of the HEI influences the Satisfaction of the students (Oyewole, Sankaran, & Choudhury, 2007). As a result, a positive Institutional Image assists the students to establish an optimistic perception about the HEI and at the same time expel the adverse ones (Andreassen & Lindestad, 1998). This study uses Institutional Image as the mediator amid the SQD and Students' Satisfaction in order to establish that Institutional Image is positively influenced on the relationship of SQD and customer Satisfaction. Thus, this can be hypothesised as:

Hypothesis 9: There is a significant mediating effect of Institutional Image on the relationship between SQD and Students' Satisfaction.

The proposed research model of relationship between SQD, Institutional Image, and Students' Satisfaction is shown in Figure. 1.
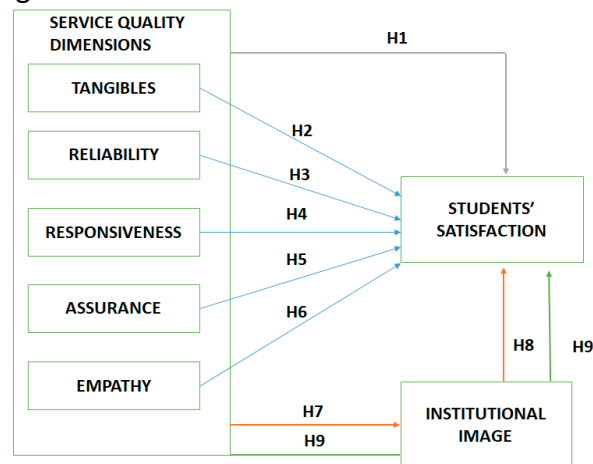
Figure 1 - Proposed conceptual model for the study

Research Methodology

The population for this research involves undergraduate students pursuing their study in the public and private universities in Mauritius. A survey questionnaire was adopted for data collection, which was sorted into four major sections, namely, Demographic (Part A), Service Quality (Part B), Student Satisfaction (Part D) and Institutional Image (Part D). All the constructs in this study were on a five-point Likert scale designed as 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

The research instrument was constructed based on scales drawn from the studies conducted by Carman (1990) and Owino (2013). The questionnaire was administered through online google forms using snowball sampling, as universities were closed due to COVID-19 lockdown. The online questionnaires were sent to expert researchers from the HEIs, who in turn sent them to their students and associates, who also sent them to other colleagues in their network.

Of the 400 completed questionnaires that were returned, 16 questionnaires were discarded because they were not completed in full. This meant that a final sample of 384 questionnaires were used for all subsequent analysis using SPSS version 22,of these participants 50.8% were males and 49.2% were females. Having collected the data, their validity and reliability were tested. Thereafter, Chi square test, cross tabulation, correlation, simple linear, multiple linear regressions, and the Sobel Test were conducted. Before conducting the multiple linear regression analysis, multicollinearity, autocorrelation, heteroscedasticity, and normality, were verified.

There were four different models in this research; the statistical tests were conducted following each type of the model. The simple linear regression was applied on the linear relationship model in order to show the relationship between two variables and to assess the value of the dependent variable (Y) in line with the particular independent variable (X). The model equation in simple linear regression was:

$$y = a + bx$$

where:

Y = predicted value of Y variable

a = the Y intercept

X = value of the independent variable

Subsequently, a multiple linear regression analysis was applied with the purpose to find the expounding relationship of two independent variables toward one dependent variable. In the proposed model, the independent variables are SQD and Institutional Image, while the dependent variable is Students' Satisfaction. The model equation for multiple regression analysis was:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$$

where:

Y = dependent variable (Students' Satisfaction)

X_1 = independent variable (SQD)

X_2 = independent variable (Institutional Image)

β_0 = constant, the value of Y when all X values are zero

ε = an error term

Data Analysis

Content validity

In order to guarantee content validity, a comprehensive review of the literature was conducted. A panel of professors and students carried out a pilot testing of the questionnaire, after which required changes were performed to enhance the content as well as the clarity of the instrument. The pilot test respondents were omitted from the main sample employed for reliability testing and hypothesis testing.

Reliability

Cronbach's alpha coefficients were employed to test the reliability of the questionnaire. Table 1 shows the Cronbach reliability coefficients of most variables are higher than the minimum cutoff score of 0.70 (Fornell & Larcker, 1981) except for Assurance which is 0.595. As per Nunnally (1994), a reliability coefficient greater than or equal to 0.50 is sufficient for exploratory studies. The obtained results of reliability analysis also indicate that the instrument used in this research is reliable and well understood among the respondents.

Table 1: Reliability of all Constructs

Reliability of all Constructs Construct	Final Cronbach's Alpha	Number of Items
Reliability	0.939	12
Responsiveness	0.853	10
Tangibles	0.915	12
Empathy	0.828	8
Assurance	0.595	7
Service Quality Dimension	0.896	5
Student Satisfaction	0.856	6
University Image	0.894	13

Descriptive statistics

It was observed that out of 384 respondents, 354(92.2%) were from the public HEIs whereas the remaining were from the private HEIs. The profile of the respondents showed that 27.7% were government sponsored while the rest of the 72.3% of students were either working or getting support from parents.

Figure 2: HEIs and Sponsorship of students

Figure 3 below shows a cross tabulation conducted to assess whether students were satisfied with the use of ICT as part of the functional service quality of the university. The results revealed that most of the students from the public HEIs disagree that the universities had adequate computer labs, access to ICT equipment, and use of online platforms.
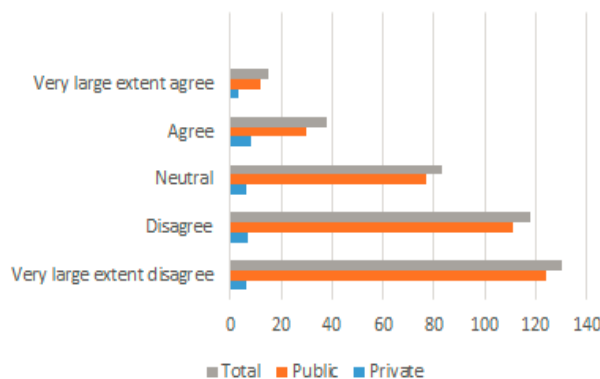
Figure 3: Use of ICT as part of the functional service quality of the University

Table 2: Chi-Square Tests between IT Factors and Students' Satisfaction

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	377.565ᵃ	57	.000
Likelihood Ratio	436.095	57	.000
Linear-by-Linear Association	35.999	1	.000
N of Valid Cases	384		
a. 50 cells (62.5%) have expected count less than 5. The minimum expected count is .38.			

In order to test whether the IT factors had an influence on the Students' Satisfaction a Chi square test was conducted. The results are tabulated in Table 2 above showing that IT factors had an influence on the Students' Satisfaction depicting they were statistically significant at the 0.01 level.

Inferential statistics
A Pearson correlation analysis was conducted to verify the research hypotheses formulated for this study and assessed the proposed relationships between the SQ constructs and the SQD.

Table 3: Correlations among SQ constructs and SQD

Hypotheses	Correlation	p-value	Significant
H₁: There is a significant relationship between reliability and the Higher Education Institution's Service Quality	.855**	.000	Yes
H₂: There is a significant relationship between tangibility and the Higher Education Institution's Service Quality	.836**	.000	Yes
H₃: There is a significant relationship between responsiveness and the Higher Education Institution's Service Quality	.801**	.000	Yes
H₄: There is a significant relationship between empathy and the Higher Education Institution's Service Quality	.914**	.000	Yes
H₅: There is a significant relationship between assurance and the Higher Education Institution's Service Quality	.805**	.000	Yes
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 3 confirmed that there is a correlation among all five constructs which influenced the SQD positively . The assessment of the hypothesis was established on all significant relationships which consisted of the positive variables. The factors of H1, H2, H3, H4 and H5 predicted that reliability, tangibility, responsiveness, empathy and assurance are associated positively with the HEI's SQ. Hence, all five hypotheses were accepted. Table 3 also indicated that there were significant inter-correlations amongst the dimensions: reliability, tangibility, responsiveness, empathy, and assurance, having the potential to affect the HEI's SQ. The results also revealed that whilst the majority of the relationships were strong, the strongest relationship was between empathy and the SQD.

To investigate the relationship between SQD and Students' Satisfaction a correlation analysis was conducted first to establish a linear relationship among the SQ constructs and Students'

Satisfaction. Table 4 below reported the result of the Pearson correlation coefficient, which suggested that the dimensions: reliability, tangibility, responsiveness, empathy, and assurance, had a direct, positive, and strong influence on the Students' Satisfaction. Therefore, the sixth hypothesis for this study (H6) proposed that there is a direct and positive influence of SQD on the Students' Satisfaction of the HEI.

The validity and predictability of the proposed hypothesis was tested using a linear regression method. The dependent variable was defined as the "Students' Satisfaction", while the independent variables were the "Service Quality Dimensions". The results of the normality tests were presented in Table 5 below. The value R was .760[a] which represented a positively strong relationship between SQD and Students' Satisfaction. Hence, undoubtedly, it could be concluded from the result obtained that the test was significant.

It was evident from the results that the Students' Satisfaction was influenced positively by the SQD of the Mauritian HEI and improving their SQ would allow them to gain higher Students' Satisfaction.

The Regression Equation Result of SQD and Students' Satisfaction Model:

$$Y_{SS} = 0.139 + 1.020 \text{ SQD}$$
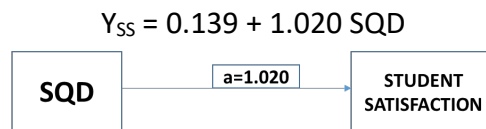
Figure 4 - Total Effect of SQD and Students' Satisfaction (Y)

The unstandardised coefficient of SQD denoted the path coefficient a. Consequently, the total influence of SQD and Students' Satisfaction, which was represented by the path coefficient a, equals to 1.020.

Table 4: Correlations among SQD and Students' Satisfaction

		Reliability	Responsiveness	Tangibles	Empathy	Assurance	Student Satisfaction
Reliability	Pearson Correlation	1	.607**	.530**	.816**	.617**	.668**
Responsiveness	Pearson Correlation	.607**	1	.630**	.697**	.594**	.625**
Tangibles	Pearson Correlation	.530**	.630**	1	.646**	.553**	.656**
Empathy	Pearson Correlation	.816**	.697**	.646**	1	.685**	.715**
Assurance	Pearson Correlation	.617**	.594**	.553**	.685**	1	.520**
Student Satisfaction	Pearson Correlation	.668**	.625**	.656**	.715**	.520**	1
	N	384	384	384	384	384	384
**. Correlation is significant at the 0.01 level (2-tailed).							

Table 5: Regression Model summary for SQD and Students' Satisfaction Model

		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1 (Constant)		.139	.137		1.015	.311
SQD		1.020	.045	.760	22.869	.000

Predictors: (Constant), SQD

Table 6: Regression Coefficient for SQD and Students' Satisfaction Model

Model	R	R Sq	Adj R Sq	Std. Err of the Est	Change Statistics				
					R Sq Change	F Change	df1	df2	Sig. F Change
1	.760ᵃ	.578	.577	.56321	.578	522.999	1	382	.000

Dependent Variable: Students' Satisfaction

The seventh hypothesis of this study proposed that there was a significant relationship between SQD and Institutional Image of the HEI. Table 6 below showed that the adjusted R^2 of the model is 0.679 with the R^2 = .679; that means that there is 67.9% of the variance in the data. The correlation between Institutional Image and SQD is R = 0.824. Since this is a high correlation, our model predicts that SQD has a strong impact on the Institutional Image of the Mauritian HEIs.

Table 7: Regression Model summary for SQD and Institutional Image Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.824ᵃ	.679	.679	.42872	.679	809.812	1	382	.000
Predictors: (Constant), Service Quality Dimension									

Looking at Table 8, the significance t value was lower than 0.05 and thus, the null hypothesis was rejected. It meant that SQD as an independent variable had a significant and positive relationship with the Institutional Image of HEIs in Mauritius. The unstandardised coefficient of SQD denoted the path coefficient b. Besides, holding an unstandardised coefficient of +0.966, it indicated that every 1-unit increase in the SQD would grow the Institutional Image by 0.966 unit.

Table 8: Regression Coefficient for SQD and Institutional Image Model

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.011	.104		-.101	.919
SQD	.966	.034	.824	28.457	.000

The Regression Equation Result of SQD and Institutional Image Model:

$$Y_{II} = -0.011 + 0.966\ SQD$$
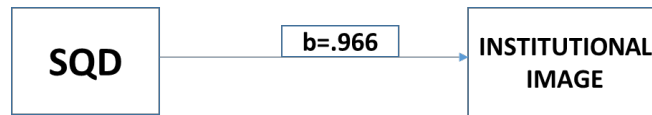
Figure 5 - Total Effect of SQD and Institutional Image (Y)

From Tables 9 and 10, it can be established that the significant t (p-value) of Institutional Image was 0.000. It was statistically significant since the p-value was lower than the significance level of 0.05; hence, the null hypothesis was rejected. It can be deduced that Students' Satisfaction had a significant relationship with the Institutional Image of the HEIs. Subsequently, the unstandardised coefficient of Institutional Image denoted the path coefficient c = 0.937, which supported the direct effect of Institutional Image to Students' Satisfaction. The results confirmed that, in the Mauritian context, the Institutional Image of the HEIs influenced the Students' Satisfaction, therefore supporting H8.

The Regression Equation Result of Institutional Image and Students' Satisfaction Model:

$$Y_{SS} = 0.491 + 0.937 \text{ Institutional Image}$$
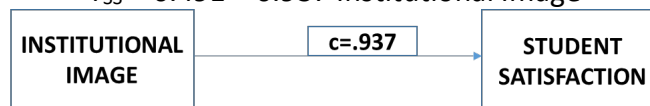
Figure 6 - Total Effect of Institutional Image and Students' Satisfaction (Y)

Table 9: Regression Model summary for Institutional Image and Students' Satisfaction Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.819ª	.670	.670	.49764	.670	777.201	1	382	.000
Predictors: (Constant), Institutional Image									

Table 10: Regression Coefficient for Institutional Image and Students' Satisfaction Model

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.491	.100		4.901	.000
	Institutional Image	.937	.034	.819	27.878	.000

Mediation of Institutional Image between Service Quality Dimensions and Students' Satisfaction

A regression with mediating variable was effected to examine whether the mediating variable, Institutional Image, influenced the relationship between SQD and Students' Satisfaction or not. From tables 11 and 12, it was seen that the significant t (p-value) of SQD and Institutional Image were 0.000; hence, they were statistically significant. Subsequently, the unstandardised coefficient of SQD denoted the direct effect of SQD to Students' Satisfaction that was mediated by Institutional Image, with 0.357. The results indicated that Institutional Image was mediating positively and significantly within the relationship of SQD and Students' Satisfaction. To test the

significance of the mediated effect, the Sobel Test was conducted and the results were shown in table 13 below. Since P<0.05, null hypothesis was rejected and supported the hypothesis H9. In addition, there was a connection between the total effect and indirect effect models. Further, it was proven that the total effect of SQD on Students' Satisfaction (a) was the sum of mediating effect (bc) and direct effect of SQD to Students' Satisfaction (a') within rounding error. Hence, the results of the Equation were 1.020 = 0.6627+ 0.357. Eventually, since the mediated value (ab) was smaller than the direct effect (a'), it revealed that institutional was to some extent mediating the relationship.

Table 11: Regression Model summary for SQD to Students' Satisfaction Mediated by Institutional Image Model

	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
Model	B	Std. Error	Beta		
1 (Constant)	.146	.117		1.251	.212
SQD	.357	.067	.266	5.305	.000
Institutional Image	.686	.057	.600	11.961	.000

Table 12: Regression Coefficient for SQD to Students' Satisfaction Mediated by Institutional Image Model

	Value	S.E	Z	Sig. (two)
Effect	0.6627	0.05979827	11.08185948	0.000

Table 13: Significance from Sobel Test for SQD to Students' Satisfaction Mediated by Institutional Image Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.833ª	.693	.692	.48085	.693	430.289	2	381	.000
Predictors: (Constant), SQD, Institutional Image									

Regression Equation Result for SQD to Students' Satisfaction Mediated by Institutional Model:

$$y = 0.146 + 0.357\,SQD + 0.686\,Institutional\,Image + \varepsilon$$

Discussion

This study established the importance of several antecedents for SQD towards Institutional Image and Students' Satisfaction and considerably added to the SQ literature in various ways. The results specified that there was a direct and significant relationship among the constructs. The SQD had a direct and significant relationship with Institutional Image and Students' Satisfaction and the findings were coherent with the research of Usman and Mokhtar (2016) and Yilmaz and Ari (2017) supporting the Hypotheses 1,2,3,4 and 5.

Thereafter, the statistics for the model consisting of simple linear, and multiple linear regressions with mediating variables, had passed the assumption tests. For a simple linear regression model,

it was concluded that SQD had a significant relationship to Students' Satisfaction in the Mauritian context supporting Hypotheses 6, 7 and 8. This result confirmed findings from previous studies, revealing that Institutional Image can play a significant role on customer Satisfaction (Ali, Omar & Amin, 2013; Hu, Kandampully, & Juwaheer, 2009; Kandampully & Suhartanto, 2000).

Further, the results showed a mediating effect of Institutional Image on the relationship between the SQD and Students' Satisfaction supporting Hypotheses 9. The findings revealed that excellent educational service quality could form positive Institutional Images of and Satisfaction with their universities. Hence, the study indicated the two causal paths influencing Students' Satisfaction: service quality → Institutional Image → Students' Satisfaction, and service quality → Students' Satisfaction.

Study Limitations

The research considered a sample of 384 students only, both from private and public HEIs in Mauritius However, the sample based on private universities was small. Due to the hurdle in inviting participants, especially private HEIs' students and because of the COVID-19 Pandemic where all universities were closed, the snowball sampling techniques were used rather than randomly selecting students. If more time and resources were available, then focus groups would have been used, as well as a more detailed study into the relationship among service quality characteristics, Students' Satisfaction, and other constructs such as behavioral intentions and word of mouth.

Conclusion

This research had provided sheer understanding to the Mauritian HEIs, that Institutional Image as a mediator was crucial in influencing the relationship between SQD and Students' Satisfaction. The key theoretical contribution of this research was investigating the moderating impact of Institutional Image between SQD and Students' Satisfaction, which was yet an unexplored area in the context of the Higher Education Environment. Therefore, this study presented an acceptable contribution to the existing literature and satisfied this literature gap by investigating the essential occurrences.

Inferred from the results of this study, it was therefore, crucial for the HEIs to pay attention towards service quality in order to achieve their key objective, i.e. Students' Satisfaction. HEIs should offer objectivity in their services and generate a positive image in the eyes of their students, which sequentially leads to the Students' Satisfaction. HEIs should earnestly interact with their students and design their services in a way to fulfill the Students' changing needs. Moreover, they should attempt to gain strategic advantage in today's ever-increasing competitive environment.

Hence, HEIs should pay more attention to the issues concerning quality of educational service. Physical facilities, curriculum, and programs were not the only requirements of students, but they also required adequate IT related support and interaction with the lecturers and administrative

staff. Subsequently, the impact of Institutional Image on Students' Satisfaction would increase when students were satisfied with services delivered.

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Effectiveness of Pedagogical Interface Agents in Enhancing Adult Computer Literacy Training

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Abstract

Currently, we live in a digital, technological-oriented era, during which most of the activities in respective domains demand computer literate skills. However, in Developing Countries (DCs), many adults still lack computer literacy skills. Therefore, it is vital to discover new ways in assisting these adults to acquire computer literacy skills, enabling them to engage successfully, participate, function and be a part of the digital technological-oriented era. Previous research findings have shown that Pedagogical Interface Agents (PIAs), may assist in reducing the learners' perception of the learning difficulty level of materials. In line with this, a simulated desktop word processor system named Simulated Microsoft Office Word System (SMOS), contains ten different types of PIAs, developed to ease computer training for technologically challenged adults. A representative of the SMOS intended user group consisted of 72 adults, who freely agreed to assess the effectiveness of the ten various types of PIAs, incorporated in SMOS, enhancing their computer training experiences and enabling them to acquire necessary computing skills. The effectiveness assessment data, collected through user testing and questionnaires, were analysed using Descriptive statistics. The analysed data results revealed that adults were satisfied with the assistance that PIAs incorporated in SMOS, given during the training, gaining a higher motivation level, with regards to their newly acquired word processor skills after training with SMOS. Based on this result, it was argued that the use of PIAs has the ability to ease the word processor training for technologically challenged adults.

Keywords : Adults, PIAs, Effectiveness, SMOS, Technological-Oriented, Training

Introduction

We are currently living in a digital technological-oriented era, during which there is a growing dependency on technology. Furthermore, computers are incorporated into every aspect of our life. Therefore, computer literacy is considered one of the essential skills that one should have to participate, live, share, communicate and work efficiently in this modern technological-oriented era. Computer literacy is the knowledge and ability to utilise computers and technology efficiently (wikia.org, 2020). To acquire the necessary computer literacy skills, one should participate in computer training, which may be either formal or informal. Wikia.org (2020) affirms that, as of 2005, obtaining necessary computer skills is a significant asset in developed countries. However, in DCs, this remains a challenge, as there is still a large part of the population, specifically adults, that have never been exposed to a computer previously, or, lack computer literacy skills. Indeed, this has been the main concern for several developing countries, South Africa being one of them. The fact that these adults still lack necessary skills and knowledge to

participate in the modern technological-oriented era, makes it practically challenging for them to contribute to the workforce and improve their participation in social development initiatives in society. Hence, a possible way of assisting them is to find means of promoting their skills development for employability, by providing them access to the necessary training opportunities, such as basic computer literacy training. Although computer literacy training is an excellent initiative to assist these adults in acquiring computer literacy skills, there remain challenges. Up to date, most computer literacy training use conventional training methods. The conventional training method, at times, is challenging for adults willing to participate. The reason for these challenges could be the fact that a vast majority of these adults lack or have limited formal education, never being exposed to a computer previously. They usually doubt about their ability to use a computer, or they may lack self-esteem. Because of their level of unfamiliarity with computers, they often require specific attention, such as one-to-one tutoring, for them to better understand.

Keeping this in mind, it is, therefore, necessary to find other innovative training methods that could ease computer training for this group of the adult population, as well as improve their computer literacy training experiences and, further reach more people who are facing the same dilemma. In line with this, the current study sought to investigate and propose innovative solutions, to support those who are unfamiliar with computers. Githens (2007), stated that the adoption of innovative solutions is the only best way to avoid further marginalising of individuals, specifically adults, who are less familiar with technology and less educated in society. Many forms of research are carried out, in the effort to propose a suitable solution to this problem. Furthermore, many recommendations are formulated on how to address this issue. For example, Wonisch and Cooper (2002) encouraged the educational multimedia and computer-based training industries to consider using pedagogical interface agents (PIAs), as a possible solution to the challenges of modern educational environments.

Mabanza and de Wet (2014), define PIAs as an animated human being, such as characters enacted by a computer, that may collaborate with the user in a socially engaging manner. Mainly, PIAs' main goal consists of easing the difficulty level of the learning materials. There is a common agreement amongst researchers that PIAs could facilitate and support human learning, in computer-mediated learning environments (Atan, Keong, Aris, Luan, Majid, and Rahman, 2008; Clarebout and Heidig, 2012; Malekzadeh, Mustafa, and Lahsasna, 2015; Prendinger, Mori and Ishizuka, 2005; Serenko, 2006). To efficiently support human learning, the PIAs may be able to exhibit some human emotional characters in textual form, graphical form, icons, voice, animation, multimedia, or virtual reality (Chou, Chan and Lin, 2003; Veletsianos, Yerasimou, and Doering, 2005). Furthermore, PIAs may play various roles in the learning environment, such as human instructors, teachers, teammates, learning companions, mentors and motivators (Atan, Keong, Aris, Luan, Majid, and Rahman, 2008; Hamed, Abu-Naser, and Abualhin, 2018; Latham, Crockett, and McLean, 2014).

Taking into account the above mentioned, the focus of this study involved finding the best approach to improve technologically challenged adults' computer literacy training experiences, by using a variety of PIAs, which differ in terms of their human characters, such as appearances,

voices, movements and genders. These PIAs play the role of human instructors, consisting of providing tips to adults on how to perform computer-related tasks. Thus, in this study, the task remains to show that the inclusion of PIAs may assist adults to overcome a few of the challenges that they encounter during computer training, meet each of their individual training goals and acquire necessary computer skills to promote their skills development for employability.

Literature Review

Existing literature reveals that PIAs have been used to support learning in various instructional domains, such as medicine, computing, mathematics, language, tourism, environments and e-commerce. In the context of this paper, the focus will be in computing. PIAs have been used in computing to facilitate learning for various computing subjects. A few examples of these subjects include: Cosmo, for teaching computer Networks (Lester, Voerman, Towns and Callaway, 1997); Smart-Egg, for teaching Structured Query Language (SQL) (Suraweera and Mitrovic, 1999); Adam, for teaching computer programming (Gilbert, Wilson and Gupta, 2005); Auto Tutor, for teaching hardware, Operating Systems, the Internet (Graesser, Moreno and Marineau, 2003); Computer, Virus Educational System for teaching Computer Virus (Sabot, Aini and Lew, 2005) and PPP Persona, for teaching Internet (André, Müller and Rist, 1996). Although the use of PIAs, to facilitate computing subjects' learning, is not a new concept, very little or almost nothing is reported in the literature about the use of PIAs to facilitate word-processing training. Hence, the requirement for the current study, which is one of the few studies focusing on a word processor system, namely, the SMOS which incorporate various types of PIAs explicitly developed, to enhance computer literacy training for technologically challenged adults.

Furthermore, the results of the previous research studies on PIAs have shown that the use of PIAs, to facilitate learning, has many benefits. PIAs increase learners' motivation, satisfaction and enjoyment, enhance comfort in a learning environment, fulfil personal relationship requirements for learning and produce greater learning gains than traditional programs (Al-Hanjori, Shaath and Nasr, 2017; Al-Nakhal and Naser, 2017; Elnajjar and Naser, 2017; Gulz, 2004; Johnson, Rickel and Lester, 2000; Mahdi, Alhabbash and Naser, 2016; Rosatelli and sSilva, 2007; Tanner and Danielle, 2013; Yan and Agada, 2010).

However, the majority of these studies, in terms of population group, concentrated more on childhood to undergraduate college students (Carmody and Berge, 2005; Mabanza and de Wet, 2014). Therefore, little is known about the benefits of introducing PIAs into adult learning environments. Hence, the main objective of this study is to assess the effectiveness of the ten different types of PIAs incorporated in SMOS, in enhancing computer literacy training, precisely word processing training, for a group of technologically challenged adults who have limited formal education opportunities.

Methodology

Study Participants

Purposive sampling seemed to be a suitable approach for recruiting the study participants. This sampling technique was appropriate, as the researcher was accustomed to the profile of the targeted population group (i.e. adults who have limited formal education and less familiar with the technology). Further, the researcher knew where to find these prospective participants who fulfilled those criteria. Hence, the participants of this study consist of a group of previously disadvantaged adults from the Mangaung University of the Free State Community Capacity Programme (MUCCP), based in Bloemfontein, South Africa.

For ethical reasons, all individual study participants completed and signed a consent form before participating in this study. The consent form contained information related to study participants' rights, protection of their privacy, their involvement and contributions to the study.

Data Collections Techniques

SMOS, user testing and questionnaires were the three main forms of data collection used to collect data required for this study.

SMOS

SMOS is a simulated desktop word processor system that contains ten different types of PIAs, developed to ease computer training for technologically challenged adults. These ten types of PIAs, as shown in Figure 1.

Figure 1: Ten different PIAs incorporated in SMOS

As shown in Figure 1, the 10 PIAs incorporated in SMOS differ in terms of their features such as genders, appearances and voices. The primary reason for doing so, was to attempt to accommodate differences that may exist between people. Naturally, people may react differently to various types of PIAs. Therefore, a combination of the different kinds of PIAs would be more beneficial than just using one specific type of PIA. Although these PIAs differ, in terms of their genders, appearances and voices, they are supposed to serve the same purpose, which is to guide or assist adults during their computer training, by providing them with essential tips on how to perform a particular word processing task, easing the difficulty of learning materials for them.

Questionnaires

The researcher used both pre-test and post-test questionnaires to collect data from the adults.

The pre-test questionnaire assisted in screening all recruits to ensure that each of them fulfilled the characteristics of the targeted user groups.

The post-test questionnaire served to gather feedback from study participants about their impressions and opinions; furthermore, the perceived experiences about SMOS, as well as their interaction with the PIAs incorporated in SMOS.

User Testing

As pointed out earlier, adult learners from MUCCP were the SMOS targeted user groups. Therefore, it was essential to assess the SMOS, by testing it with a representative of its intended user groups. Doing so would allow the researcher to measure the effectiveness of the SMOS, enhancing the computer training experiences for adults and assisting them in achieving their computer training goals.

Firstly, all study participants received initial SMOS training, to familiarise themselves with the system. Before providing the participants with the user testing tasks, the researcher clearly explained the importance of their contribution and involvement in the study, as well as the objectives of the user testing. During the user testing session, every participant performed various Word processing tasks, using the different ten types of PIAs incorporated in SMOS. The following are a few examples of user testing tasks performed by study participants: (i) creating a document, (ii) editing a document (i.e. change fonts, colours, etc.), (ii) saving the document. Figure 2 illustrates an example of a participant busy using a realistic female dog PIA incorporated in SMOS, to perform the given user testing task.

Figure 2: A participant interacting with a female realistic dog agent

The picture displayed in Figure 2, shows a participant utilising his earphones, while interacting with a female realistic dog agent. The earphones allow him to listen to the step by step instructions, given to him by a realistic female dog agent, on how to perform a specific task.

Data Analysis And Interpretation

Profile of Study Participants
A total of 72 adults voluntarily agreed to participate in this study, as well as to perform user testing tasks on the SMOS and, further, were requested to fill in questionnaires.

Pre-test questionnaire
The pre-test questionnaire served to collect data regarding the study participants' biographic data (i.e. participants' gender, age, English language ability and education levels). Amongst the 72 adults participating in this study, 57.0% of them were females and 43.0% were males. There was a variation, with regards to their age groups (e.g. less than 20 years to over 40 years). Nevertheless, it was noted that half of them belong in the 20-30 age groups. Regarding their level of language proficiency, they were all (100%) able to speak and understand English. Their educational levels differ with 65.0% of them being matric certificate holders, 25.0% having grade 11 as their highest qualification, a further 7.0% passed Grade 10, 2.0% had Grade 9 and the remaining 1.0% did not indicate their education level.

In summary: Study participants consist of both males and females, with the number of female participants being dominant. Half of the participants were of the 20-30 age group, having matric certificate as the highest qualification and could speak and understand English.

Post-test questionnaire
The post-test questionnaire served to collect data about study participants' impressions and opinions, with regards to their interaction experiences with PIAs incorporated in SMOS. Table 1 summarises the study participants' impressions and opinions about the PIAs.
Data presented in Table 1, shows the numbers of respondents (N) who chose either Strongly Disagree (SD), Disagree(D), Not Sure (NS), Agree (A) and Strongly Agree (SA) for each statement. The Sum of A and SA was used to examine and to contrast participants' impressions and opinions on each of the statements concerning PIAs' hints and the use thereof. Descriptive statistics (mean and standard deviation (STD)), displayed on the table, are based on the scores for each statement.

Table 1: Participants' Impressions of PIAs' hints

Statement	N	SD	D	NS	A	SA	Sum of A and SA	Mean	STD
The PIAs' hints provided all the necessary information.	71	1	6	4	23	37	60	4.25	1.00
		1.4%	8.5%	5.6%	32.4%	52.1%	84.5%		
The PIAs' hints helped me to quickly learn how to perform a particular task.	72	0	0	1	37	34	71	4.46	0.53
		0.0%	0.0%	1.4%	51.4%	47.2%	**98.6%**		
The PIAs' hints helped to recall the different steps involved for a particular task.	71	1	0	6	32	32	64	4.32	0.75
		1.4%	0.0%	8.5%	45.1%	45.1%	**90.1%**		
The PIAs' hints assisted me in identifying my mistakes when performing a task.	70	3	3	8	31	25	56	4.03	1.02
		4.3%	4.3%	11.4%	44.3%	35.7%	80.0%		
With the PIAs, it was quicker and easier for me to recover from a mistake.	70	0	7	5	32	26	58	4.10	0.92
		0.0%	10.0%	7.1%	45.7%	37.1%	82.9%		

Referring to Table 1 above, as per study participants' impressions and opinions about their interaction with the PIAs incorporated in SMOS, most participants strongly agreed/agreed that the PIAs' hints greatly assisted them in achieving the following:

- Be able to quickly learn how to perform a particular task (98.6%),
- Be able to recall the different steps involved for a particular task (90.1%),
- Provided all the necessary information (84.5%),
- Complete the tasks quicker (82.9%), and
- Identifying mistakes when performing a task (80.0%).

Findings

The results listed above reveal that the highest opinions or impressions as perceived by study participants, with regards to the hints that they received from the PIAs, were the following: their

ability to quickly learn how to perform a particular task and their ability to recall the different steps involved for a particular task. A numbers of factors may have contributed to these results, such as the use of voice by PIAs, to communicate with participants and the guidance provided by PIAs to participants (i.e. steps by steps tips on how to perform a particular word processor task) may have made it simpler and quicker for them to understand and perform the various word processing tasks given to them. Hence, these results are an indication that PIAs incorporated in SMOS may efficiently enhance computer training for technologically challenged adults. Based on these results, it may be said that PIAs can facilitate computer training for adults, by allowing them to train by themselves, with little or no human intervention (instructor) required. Since PIAs may facilitate self-training and seem to be useful tools to use for training more adults, particularly those in areas where there is a shortage of qualified computer training instructors to run the program, as well as rural areas where people would need to walk to get to training centres.

Furthermore, the results of this study are in line with the claims made by Al-Hanjori et al. (2017), Al-Nakhal and Naser (2017), Elnajjar and Naser (2017), Gulz (2004), Johnson et al. (2000), Mahdi et al. (2016), Rosatelli and sSilva (2007), Tanner and Danielle (2013) and Yan and Agada (2010), that PIAs increase learners' motivation, enhance comfort in a learning environment and produce further significant learning gains than traditional programs.

Conclusion

The current study aimed to evaluate the efficiency of SMOS, which is a system developed to facilitate computer literacy training for adults who are unfamiliar with computers. SMOS incorporated ten different types of PIAs, which were intended to provide adults with a step by step guide on how to perform a particular word processing task. A representative of the SMOS intended user group, consisted of 72 disadvantaged adults. They evaluated the effectiveness of the 10 PIAs incorporated in SMOS, by enhancing their computer training experiences and supporting them in acquiring necessary word processor skills. The evaluation result, as per the adults' opinion or impressions about PIAs incorporated in SMOS, revealed the hints that adults received from the PIAs made them able to quickly learn how to perform a particular task and being able to recall the different steps involved for a particular task. This result supports the claims made researchers, such as by Al-Hanjori et al. (2017), Al-Nakhal and Naser (2017), Elnajjar and Naser (2017), Gulz (2004), Johnson et al. (2000), Mahdi, Alhabbash and Naser (2016), Rosatelli and sSilva (2007), Tanner and Danielle (2013) and Yan and Agada (2010), that PIAs increase learners' motivation, enhance comfort in a learning environment and produce more significant learning gains than traditional programs. Hence based on this study result, it is, therefore, argued that the use of PIAs for adult computer literacy training, could effectively ease the word processor training for adults who are less familiar with the technology and assist them in achieving their training requirements.

Although the current study seemed to be a positive effort towards solving the problems faced by technologically challenged adults during computer training, it further had a few limitations. The following are suggestions formulated for possible future research, to improve the SMOS, based on the limitations identified during this study:

- study participants were adults who could speak and understand English, as PIAs incorporated in SMOS provided the step by step instructions in English. The possibility of using other local South African languages could be explored.

- The SMOS solely included simple functionalities, judged to be necessary for this study. The possibility of adding more advanced features in future could be considered.

- Participants performed simple word processing tasks using SMOS. In the future, the possibility of participants to work on complex tasks, could be explored.

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Micro-credentials – implications for the future of university qualifications

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Abstract

2020 will be known as the year that shook the very foundations of our existence and perhaps changed the world forever. The disruption and impact of the COVID-19 pandemic on global economies, government priorities and policies, industry and business operations, health and welfare services, access to sport, recreation and tourism, and the nature of the education sector are profound. As government and health authorities struggle to control the outbreak and implement recovery strategies, leaders in all fields of endeavour are searching for ways to adapt their business models, so that they can continue to provide quality services and products, whilst staying safe and economically viable.

The university sector has taken a significant hit with restrictions on international student travel and face-to-face delivery. Most universities have been forced to adopt digital modes of delivery, which has been challenging, especially for universities not already proficient and well-resourced for operating in an online environment. The significant loss of income from international student fees means that universities are desperately seeking new business models and additional sources of funding. In Australia, micro-credentialed short courses are a potential avenue being explored by universities, with encouragement and support from the Commonwealth Government. On announcing new grants for universities, targeted at boosting domestic student participation, the ministers claimed: *'These reforms will help universities pivot towards a closer alignment of domestic industry and student demands through innovative micro-credentials delivered flexibly online'* (Tehan & Cash, 2020).

This paper was motivated by a desire to better understand the impact of the current rise in popularity and growth of micro-credentials on the quality and status of university qualifications. Whilst the review and discussion largely focus on the Australian context, research and case studies are also drawn from North America. It is evident from a cursory review of international literature that New Zealand, the United Kingdom and European institutions are also offering online micro-credential courses and that pathways and credit into university programs are being mapped to their respective local Qualification Frameworks.

Keywords: Micro-Credentials, Entry Pathways and Credit, Need for Systematic Transparent Processes, Impact on University Qualifications

Context

2020 will be known as the year that shook the very foundations of our existence and perhaps changed the world forever. The disruption and impact of the COVID-19 pandemic on global economies, government priorities and policies, industry and business operations, health and welfare services, access to sport, recreation and tourism, and the nature of the education sector are profound. As government and health authorities struggle to control the outbreak and implement recovery strategies, leaders in all fields of endeavour are searching for ways to adapt their business models, so that they can continue to provide quality services and products, whilst staying safe and economically viable.

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What are micro-credentials?

In the twenty-first century, Australia's tertiary education and training sector is experiencing a surge in interest in skills-based training, levels of competency and employer-driven professional development short courses. Most recently, the discourse on this topic has included discussion on micro-credentials. Micro-credentials are consistently described in the literature as short courses, offered outside formal education systems, generally designed to address a specific workplace skill or need (Oliver, 2019, pp. 18-19).

Articles on micro-credentials often refer to achievement of digital badges, modelled on the Scouting movement's badge system. The badges are used to motivate, measure and track competencies (specific skill-sets). Professional bodies and various higher educational institutions around the world including universities in Australia (Charles Darwin, Griffith and Deakin) have become early adopters of digital badges in connection with micro-credentials (Lemoine & Richardson).

Oliver (2019) recently completed a quality, in-depth report on micro credentials entitled 'Making micro-credentials work for learners, employers and providers'. In this report she proposes agreement on a clear definition of micro-credentials that maps to the internationally agreed, International Standard Classification of Education (ISCED, 2011), adopted by UNESCO, which defines non-formal education as: *an addition, alternative and/or a complement to formal education…*(it) *does not necessarily apply a continuous pathway-structure…it caters for people of all ages, but it may be short in duration and/or low intensity, and it is typically provided in the form of short courses, workshops or seminars. Non-formal education mostly leads to qualifications that are not recognized as formal qualifications by the relevant national educational authorities or to no qualifications at all (*ISCED, 2011 Glossary).

As an everyday definition, Oliver (p. 19) suggests: '*A micro-credential is a certification of assessed learning that is less than a formal qualification'*. However*,* she submits that a micro-credential used for admission or credit earning, needs greater explanation: '*Credit-bearing micro-credentials include assessment aligned to a formal qualification level…Credit-bearing micro-credentials mirror and contribute to the academic standards required in the target qualification(s). The duration and effort required by the learner are in keeping with the amount of credit earned in the target qualification(s)'* (Oliver, p.19).

Inherent in Oliver's explanation of a *'credit-bearing micro-credential'* is the need for 'benchmarked evidence of assessed learning'. It is this aspect which distinguishes micro-credentials from other forms of short courses and enables the potential for entry and credit transfer into university programs. Confidence in the standard and quality of the assessment undertaken in the micro-credential course, when it is used for entry or credit towards a university qualification, is at the heart of the investigation undertaken in this paper.

Traditional short course providers

Short trade, industry and profession-based courses are not new. In Australia, certificate-bearing, industry short courses have been provided for many years, through the Vocational Educational and Training (VET) sector by Technical and Further Education (TAFE) Institutes and, (Registered Training Organisations (RTOs). Several of these courses already have established pathways and credit arrangements with universities based on the Australian Qualifications Framework (AQF). Other countries have similar Technical Training and Trade Institutions and entry/credit schemes.

Global companies such as Amazon, Google and McDonalds provide their own staff training programs and in Australia, large corporations such as Myer and Bunnings provide in-house staff training and professional development programs on such topics as quality control, health and safety, customer service and handling conflict and complaints. Many of these programs are couched within the AQF Levels I to IV Certificates in Retail and Retail Services. As a rule, few if any, courses below Level IV are recognised by universities for entry, advanced standing or recognition of prior learning (RPL).

Professions such as accounting, engineering and management offer certified courses which are mostly an extension to university qualifications, and in many cases, give employees greater access to promotional opportunities. In Australia, professions such as pharmacy require an

additional year's internship with a qualified pharmacist before being eligible for registration, and in the legal profession, law graduates must also undertake an internship or post graduate practical training course before being eligible for registration. The Victorian Institute of Teaching in Australia has introduced tests in numeracy and literacy, which all applicants must successfully complete, before being considered for registration. These examples of internships, practical training placements and extra hurdles post-graduation, fall outside the definition of micro-credentials.

The introduction of online courses

The concept of a micro-credential does not imply or demand that courses be online. However, current practice suggests that online delivery is the popular format for micro-credentials. This approach has been reinforced by COVID-19 which, at the height of the pandemic, prohibited face-to-face teaching in many education institutions around the world.

Whilst Massive Open Online Courses (MOOCs) and similar online programs do not fit within the definition of a micro-credential, in that they are usually based on a formal award program and extend over several semesters, there are lessons to be learned for online micro-credential developers, by investigating the outcomes to date of MOOC. especially in terms of student 'intention,' 'participation' and 'completion' data.

The introduction of MOOCs, and variations such as Coursera, largely facilitated by advances in digital technologies and increased household-access to the internet, represent a major global development in online education in the twenty-first century. MOOCs are free courses, generally designed and offered by universities or subsidiary businesses, to anyone who had access to a computer and the internet. A fee is usually required if participants wish to be awarded a certificate or qualification for successful completion of the assessment tasks within the course, otherwise participants are free to draw upon the course materials in any way they choose. They can watch videos, listen to online lectures, engage in chat room discussions, download the resources, even complete the assessment, without making any payment.

When MOOCs were first introduced, it was predicted that they would transform the higher education and training sector and challenge the existing concept of formal higher education. Initially, hundreds of thousands of students enrolled in MOOCs. The data still suggest that enrolment rates with some providers is very high (Ahearn, 2019). However, completion rates have always been low, regularly reported as being in the range of 5%-15% (Ahearn, 2019). Some of the reasons suggested for such low completion rates relate to the difficulty of sustaining student motivation and the lack of face-to-face interaction with lecturers and other students. Other factors that impact negatively on the traction and completion of MOOCs include the varying quality of the MOOCs, and the absence of an endorsed, systematic sector-wide credit recognition and transfer scheme. The appeal of MOOCs to adult learners who have no, or minimal independent study experience and limited computer skills, is also questionable. The attitude of employers toward MOOC certificates or 'digital badges', is another untested factor. It is unclear if employers are satisfied that MOOCs adequately address and meet workplace needs.

However, despite the low completion rates of MOOCs and the sceptics who are quick to claim MOOCs a failure, the fact is that the number of enrolments in MOOCs is still high and, in some cases, continues to grow. Deeper understanding as to why some enrolments continue to grow while completion rates remain low is likely to provide insights for those proposing to roll out micro-credentials. Questions that need further investigation include: Why do people enrol in MOOCs? How do users engage with the resources and material provided on these online sites? What are the attitudes of employers to such courses?

Ahearn (2018) is a successful MOOC designer for Stanford and +Acumen who is experiencing growing enrolments. She suggests that focussing on completion rates is the wrong metric to use when evaluating the impact of MOOCs on learning and workplace practices. She prefers to focus on enrolment numbers and examine how the users are engaging with MOOCs. She observed that many users dip in and out of the content. She found from user-surveys and feedback that MOOC users sign up, download the readings and workbooks, watch a select number of the videos, and even take key insights back to their team or workplace, but seldom complete and upload all of the assignments. She further reported that MOOC users indicate that they enrol in the course for specific learning goals and to acquire selective knowledge and skills and are not motivated by earning a certificate (digital badge).

Ahearn also found that this trend was corroborated by researchers from HarvardX (a university-wide initiative of Harvard University designed to support online learning), who examined *'intention'* data rather than *'completion'* data to better understand the role and success of MOOCs within the educational environment. Their findings reported that only just over half of the students who enrolled in a MOOC intended to complete a certificate, others just wanted to audit, browse or were unsure. One of the key takeaways reported from the study was: '*Course completion rates, often seen as a bellwether(sic) for MOOCs, can be misleading and may at times be counterproductive indicators of the impact and potential of open online courses'* (Reich, J. et al, p. 1).

Ahearn noted a similar trend in a study from Columbia University (Hollands and Kasi, 2019), where learners enrolled with the expectation of career benefits by improving job performance. The study also showed the only 35% of students who enrolled in a MOOC intended to earn the credential (certificate). An earlier study by Campbell et al (2014), referred to the importance of further research into the motivation and intention of MOOC participants and completion rates. This study, conducted at the University of Toronto, compared two cohorts of MOOC participants, one which participated in real-time and the other which accessed the archived version of the MOOC. They found that the archived MOOCs were especially valued as reference sources and for independent, self-directed professional development.

The appeal of micro-credentials

The literature suggests that many universities in Australia are following their international counterparts and are starting to offer micro-credential courses and digital badges. The 2019 Noonan Review of the AQF refers to research provided by DeakinCo, which indicated that 36 of 42 universities are either offering or developing micro-credential courses (Noonan, p. 55). Some universities have turned to this business model to stay competitive as the more expensive

scholarship model of lengthy degree and postgraduate award programs are becoming less affordable for students.

The 2020 COVID-19 pandemic has ignited interest in digitally delivered short courses (micro-credentials) as a result of massive falls in international student enrolments, and an embargo or restrictions on face-to-face teaching in most educational institutions in Australia. An article in The Australian Higher Education Supplement, Dodd (2020), reported Open University Australia's (OUA) entry into the micro-credentials market. OUA has partnered with 'OpenLearning' and is offering grants to support OUA affiliated universities develop short courses. It is envisaged that these courses will be shorter than a standard university unit length, varying from 2½ hours up to 150 hours.

Employers and industry-based stakeholders are attracted by the idea of micro-credentials where these courses provide a steady flow of work-ready graduates (employees). However, the 'devil is in the detail'. University leaders should be concerned about the impact of employer and industry groups on the ownership and oversight of course accreditation. This trend could lead to industry sponsored certificates being favoured in the workplace over university awards, leading to a general devaluing of university qualifications.

Oliver's premise is that due to the rapid rate of change in the workplace and the need for employees to learn new skills and efficient ways of working, the systematic introduction of micro-credentials, which provide ratified credit into University award programs, may be one way of addressing the need for work-ready, new and existing employees. But, she cautions, micro-credentials alone will not meet any nation's future educational needs: *the key opportunity is to enable formal qualification systems to evolve to include short form credentials, some of which might be credit-bearing* (p. i).

Credit towards university awards

It is in this area that practice is outpacing the development of policy and procedure. Whilst, many university academic directors and academic boards are starting to come to terms with the growth and variety of micro-credential courses, most universities lack policies and procedures for systematically benchmarking micro-credential assessment with university awards and qualification frameworks, for the purpose of establishing threshold standards for entry or credit.

The AQF, introduced in 1995 to underpin the national system of qualifications in Australia, encompasses the higher education, vocational education and training, and school sectors. Among other features, the framework provides policy requirements for qualification linkages, student pathways and guidelines for credit transfer into higher education courses. Whilst, the initial version of the AQF does not specifically refer to micro-credentials it does provide for recognition of VET certificates as pathways and credit towards higher education awards.

In a review of the AQF in 2019, led by Noonan (2019, p. 55), he reports that the *'Panel concluded that it was important to address the relationship between shorter form credentials, including microcredentials, and full AQF qualifications.'* The view of the panel was that the revised framework should recognise, perhaps in a preamble, the variety of skill-based and training credentials that sit outside the formal AQF, but not assign them to any designated AQF level.

This position was consistent with stakeholder feedback to the review which was not in support of including shorter form credentials in the AQF as qualification types. The panel did acknowledge the potential for students to be given credit and recognition of prior learning (RPL) for successful completion of micro-credential courses; a practice which is already in place for many VET and industry-based courses, and professional experience.

The Noonan (p.54) report referred to Oliver's definition on what might be considered credit-bearing micro-credentials. The key elements in this definition are that courses must include *assessment aligned to qualification level and that the duration and effort required by the learner are in keeping with the amount of credit earned in the target qualification(s).*

The significant challenge for universities and regulators is how to design, implement and quality assure, a system-wide process for standardising and managing the awarding of credit and RPL that treats all students fairly and that does not devalue the quality and status of university awards.

Questions which arise when considering the validity of a micro-credential course for entry into a higher education award program and for academic credit (advanced standing) include:

1. Does the assessment completed in the micro-credential course provide convincing evidence of the likelihood that the learner has the necessary pre-requisite knowledge and skills to successfully cope with the academic requirements of the target course?
2. Does the assessment completed in the micro-credential course align with the quality and standard of the assessment required in the target qualification and does the micro-credential assessment demonstrate a comparable amount of effort and time commitment, as the credit earned in the target qualification?

Reciprocal pathway and credit arrangements

The need for reciprocal arrangements is often overlooked when mapping pathways between education sectors and preparing guidelines for credit transfer. Mapping exercises usually focus on providing credit transfer from training and industry courses into university programs, but often fail to consider pathways and credit from university courses into training courses. At first glance this may not seem necessary. However, it does become an issue when university graduates are locked out of employment in an industry. In Australia, if a university graduate has not completed the nominated fitness industry certificate or micro-credential course, they will not be employed in that industry, even when they have a university degree in exercise physiology, human movement or similar discipline. Their university qualification is not afforded reciprocal credit.

Implications of micro-credentials for universities

Considering the potential growth of micro-credential courses in universities, the need for ongoing research and monitoring of the impact of micro-credentials on the higher education sector is required. Particularly, research to address some of the pressing issues related to developing evidenced-based, equitable and transparent systems and sector-wide guidelines for mapping pathways and credit into university award programs. If the policies and procedures for pathways and credit are not adequately documented, validated and communicated, micro-

credentials have the potential to undermine the academic quality, integrity and value of traditional university qualifications and the institution itself.

The University of Western Australia (2020) is an example of a university that has led the way in establishing and implementing a comprehensive policy on micro-credentials. Its policy covers two types of micro-credentials offered by UWA and provides agreed pathways and a systematic approach to awarding credit for external micro-credentials.

Another important factor linked to awarding university credit for assessment completed in a micro-credential course, is the need to verify that the assessment tasks were undertaken by the enrolled student and not a surrogate. Granted this is true of any online course, but the likelihood of this being detected in a short course with potentially large enrolments, especially if delivered by an external provider, is less likely than in a more coordinated university course where a student's academic performance and any misconduct, is recorded, monitored and reviewed throughout the degree.

Stakeholders

This cursory literature review into the current rise in popularity of micro-credentials identified the following main stakeholder groups. These are:

Students and parents – who are concerned about the rising cost and length of university degrees, the burden of large student loans, and the perceived declining currency in the workplace of some university qualifications.

Employers and industry groups – who complain about a lack of 'work-ready' graduates and the difficulty recruiting graduates with the necessary skill-sets. Employers support more tailored micro-credential courses designed to prepare employees for the workplace, preferably led and regulated by industry or business groups (Noonan, p. 59).

Universities and education providers – which are experiencing a huge drop in international student enrolments and are overwhelmed by increasing costs of infrastructure, administration, teaching and research. Most universities are desperately seeking alternative sources of income and short, online micro-credential courses seem one option, poised to fill this space.

Qualification authorities and regulators – which have responsibility for setting qualification standards and monitoring compliance. In Australia, the AQF has not aligned micro-credentials to qualification levels but suggests the inclusion of a preamble in the document to acknowledge their existence within the education mix. Other countries have started to map credentials to qualification frameworks.

Government departments – which are constantly juggling budgets and increasing borrowings to fund and 'prop-up' growing university deficits, whilst navigating competing political, industry, business, university and community agendas.

Taxpayers – who are becoming more vocal and discerning about how their taxes are spent, and in some cases question the value of university activities, including qualifications and research.

The impact of the COVID-19 pandemic, which hit Australia in March 2020, highlighted the urgency of addressing the issues raised in the review. Restrictions on international student

travel and face-to-face teaching resulted in the need for universities to quickly identify other sources of income, including the potential for growth in short online courses (micro-credentials).

The evidence suggests that most universities and many other providers are already offering or are considering online micro-credentials as a way of replacing some of the lost income (Noonan, p. 55). However, there is a lag in the development of policies, procedures and systems for managing quality assurance of micro-credentials, particularly where the courses are being positioned as entry pathways and credit into existing university qualifications.

Recommendations

The following recommendations are designed to address some of the quality assurance issues to do with micro-credentials:

1. Policies, procedures and systems for assessing entry and awarding credit for successful completion of micro-credentials into university awards, need to be validated, documented, transparent and applied consistently across the sector.
2. Quality assurance processes need to verify that students offered an entry pathway into a university award program have the necessary pre-requisite knowledge and skills to be successful.
3. Quality assurance processes need to verify that if credit is given for assessment undertaken in a micro-credential course that the standard of the micro-credential assessment reflects the university's assessment, for which credit is being given, in terms of degree of difficulty, and time commitment.
4. Pathways for entry and credit need to be reciprocal from one sector to another. For example, if an industry sponsored micro-credential is given a pathway and credit into a university course, then a student should also be given credit for related study undertaken in the university course towards the industry micro-credential.
5. If universities are going to survive the impact of COVID-19 and the changing attitudes of stakeholders towards the value of a university qualification, they will need to consider how they can transform the function and structure of universities to meet the needs of a changing society, whilst upholding the key mission, values and status of the university.
6. Government leaders responsible for funding universities need to collaborate with academic leaders, scientists, artists, futurists and business innovators to help re-imagine a university designed for the 21st century.

Conclusion

The review and discussion outlined in this paper raises the issue of the potential impact of micro-credentials on the reputation, status and value of university qualifications and, by inference, the future of universities. Universities have traditionally been places where research, scholarship and excellent teaching and learning are pursued. One major concern is the cost, in terms of loss of innovation, ingenuity, and research devoted to solving the world's problems if universities become beholden to employers and business. Another concern is the potential erosion and threat to the quality and value of university education if universities collude in a

vision of education whereby learners 'stack-up' micro-credentials like pancakes, in preference to, pursuing holistic, comprehensive, sequential and integrated qualifications.

The value of a university education is already under the microscope. A recent poll conducted by The Policy Institute at King's College London and Ipsos (2020), reported that 62% Australians believe university degrees have declined in value in the past 10 years, which was consistent with an average of 61% for the eleven countries polled. In Germany, 50% of those polled reported a decline in the value of university education, whereas in China 76% reported a decline. In Australia only 49% of those polled believed the benefits of going to university outweighed the expense and 52% thought that universities do not equip graduates with the skills needed to be successful in a career in Australia, twice as many as the quarter who thought they do.

University leaders around the world are facing some significant challenges. Addressing such diverse factors as: escalating course fees; fulfilling student expectations; managing increasing costs of university infrastructure; upholding the academic integrity and quality of research and teaching; meeting workforce and employer needs; and, achieving community and global expectations, does not lend itself to a single or simple solution.

The nature and standing of micro-credentials will require substantially more research, discussion, policy development, regulation and systematic quality assurance, to ensure that they add to, not subtract from, disadvantage, replace or devalue university qualifications. Also, the need for reciprocal credit arrangements between micro-credentials and university awards cannot be overlooked. Policy makers within the university sector need to ensure that industry-based micro-credentialed courses do not lock-out university graduates from specific industries.

This review sheds some light on the potential positive and negative implications of micro-credentials on the future and value of university qualifications. The proposed recommendations are offered as a practical way forward, to minimise the risk of micro-credentials becoming a 'Trojan Horse' within the university sector.

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Engagement – The Key to Digital Learning and Teaching

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Abstract

A focus of the digiTAL 2020 conference is to 'consider all aspects of teaching and learning from initial curriculum design, through to improving engagement, assessment and feedback'. The purpose of this paper is to reinforce the importance of engagement in learning and teaching and to illustrate how engagement can be triggered and strengthened by reference to a framework informed by contemporary neuroscience on how the brain functions and how learning occurs in the brain. Initially, the paper examines the concept of engagement in educational literature, theory and practice. In keeping with the digital theme of the conference and in response to the impact of COVID-19 on the delivery of education world-wide, discussion on the application of the framework focuses on approaches to digital learning and teaching. A key message for curriculum designers is that digital learning and teaching should not be driven by technology, but instead, draw upon and select available technologies which support the learning concepts in this framework. Many of the examples cited assume that teachers and students have access to at least one type of digital device and a reasonably reliable internet service. In communities where this is not the case, the neuroscience principles still hold but the breath of activities may need to be customised to the specific learning context.

Keywords: Engagement, Online Learning and Teaching, Digital Technologies, Neuroscience Research, Brain Friendly Learning Strategies

Introduction

A focus of the digiTAL 2020 conference is to 'consider all aspects of teaching and learning from initial curriculum design, through to improving **engagement**, assessment and feedback'. The purpose of this paper is to reinforce the importance of **engagement** in learning and teaching and to illustrate how **engagement** can be triggered and strengthened by reference to a framework informed by contemporary neuroscience on how the brain functions and how learning occurs in the brain. Initially, the paper examines the concept of **engagement** in educational literature, theory and practice. In keeping with the digital theme of the conference and in response to the impact of COVID-19 on the delivery of education world-wide, discussion on the application of the framework focuses on approaches to digital learning and teaching. A key message for curriculum designers is that digital learning and teaching should not be driven by technology, but instead, draw upon and select available technologies which support the learning concepts in this framework. Many of the examples cited assume that teachers and students have access to at least one type of digital device and a reasonably reliable internet service. In communities where this is not the case, the neuroscience principles still hold but the breath of activities may need to be customised to the specific learning context.

Engagement in education

In the twentieth century, when the concept of **engagement** appeared in higher education literature, it was primarily in relation to the need for universities to reach out to their local communities. Boyer (1991) spoke and wrote about the **'scholarship of engagement'**. His observation was that educational institutions, especially universities, had lost their standing and influence in the community. He challenged universities to re-engage with civic and moral issues and key community and service institutions. He felt that the academy had become too inward looking, and that its research activities were narrowly focused and of limited interest or value to the community. He also advocated for research and systematic study into the scholarship of teaching and learning processes.

Although not expressed in terms of **engagement, the** progressive educational philosophy of John Dewey (1938) during the twentieth century, can be viewed as laying the foundations for contemporary approaches to **engagement** in learning and teaching. In his seminal essays on '*Experience and Education'*, Dewey promoted the importance of 'learning by doing'.

Throughout the twentieth century, the work of Dewey, and many other educational theorists who often drew on the discipline of psychology, profoundly influenced approaches to contemporary education. This cross-fertilisation led to learning and teaching approaches and movements such as experiential learning, pioneered by Kolb (1984), the early constructivist theories of Piaget (1962), who promoted the value of play in learning, Vygotsky (Hall, 2007), who espoused the value of social interaction as a basis for cognition and Schön (1983) who advocated the importance of reflective practice. The origins of active learning and problem-based learning (PBL), which use student-centred and learner-centred learning strategies, can be traced back to Dewey's 'learning by doing' philosophy.

In the twenty-first century, many university faculties around the world have adopted approaches to learning and teaching which reflect trends promoted by supporters of active, experiential, and reflective practice learning. Several medical schools use PBL throughout their entire curriculum. Concepts such as the flipped classrooms, project work and inquiry-based learning, are also evident where student-centred learning approaches have been adopted in preference to more traditional didactic approaches to education. This changing view of the role of the teacher/lecturer was described by King (1993, p. 30), as moving from a '*Sage on the Stage to a Guide on the Side'*.

The concept of **engagement** is a helpful way to capture and describe the key approaches being advocated and implemented in contemporary learning and teaching theory and practice.

The impact of advances in digital technologies on engagement in education

Around the beginning of the 21st Century, universities, and higher education institutions around the world, started experimenting with a range of blended, and online learning and teaching formats as an additional or alternative way to **engage** with students. Initially, their intention was to extend the reach of courses to remote learners and to students who were not able to attend traditional face-to-face classes. As well as catering for off-campus learners, models of blended learning, which incorporated online learning with face-to-face learning, were also driven by on-campus students seeking further support for their learning.

While many educators, working in face-to-face environments in higher education, endeavoured to **engage** with their students by moving to more interactive and learner-centred models of teaching, the complexity of translating face-to-face teaching to blended and online learners required significant staff professional development and upskilling, which was not always available.

Web designers quickly identified the need for software programs and training that would organise, facilitate, and enrich online interaction, and **engagement** between teachers and students. They envisaged the development of various learning platforms, portals, and customised online sites, which later, collectively became known as Learning Management Systems (LMS). The systems were designed to act as a one-stop, online-site for students and teachers. Early developments in the LMS space included *Blackboard, Moodle and Canvas*. Interestingly, the creator of Moodle, a highly successful, free access LMS, was an Australian who grew up in outback Australia and received much of his early education via the ABC's 'School of the Air'. This program utilised two-way radio contact between the teacher and pupil inspired by the Flying Doctor system, perhaps the ideal preparation for understanding the needs of isolated learners and the challenges of inspiring and maintaining motivation and **engagement** over long distances.

Some of the early features integrated into an LMS included the ability to upload course and unit outlines, lecture notes, and visual and audio presentations. These features were followed by the provision of chat rooms, notice-boards, quizzes, and secure assessment drop boxes. The expansion of the internet, and the development of specific software programs such as *Camtasia, Snagit, Relay*, designed to capture lectures, added to the learning resources available through the LMS. The proliferation of portal digital devices such as personal lightweight laptops, IPads and SmartPhones, which have the ability to connect to the internet, record videos, take photographs, access APPs and software programs such as YouTube, Skype, and Zoom increased the potential for interactive learning. Learning was no longer confined to a lecture theatre, classroom or designated teaching space but could occur anywhere, and at any time, providing the learner had access to a portal digital device and the internet.

COVID-19 pandemic changed the face of education in 2020

In 2020, the rapid and exponential spread of the COVID-19 pandemic, resulted in home isolation policies and temporary closure of most of the world's public and private educational institutions. This in turn, led to a wild scramble to move education and schooling online. Universities that were already utilising aspects of digital learning and teaching adjusted more easily to this new way of delivering education. Others struggled to reframe their curriculum for online learning and teaching and to provide adequate staff professional development on the use of the available technologies. Whilst there is general agreement among academics that quality online teaching is much more than uploading lecture notes and powerpoint slides, many lecturers were, and still are, under-prepared and overwhelmed by the pace of change and the breadth of student expectations.

A tendency in digital learning and teaching is to allow the technology to drive the agenda. The framework presented in this paper places neuroscience-based knowledge at the heart of learning and teaching design, delivery and assessment and regards technologies as tools to help

achieve the desired educational outcomes. It is not the intent of this paper to suggest that the findings from neuroscience are only relevant to digital learning and teaching. But due to the current focus on homeschooling, and remote and online delivery of education, the discussion, and examples in this paper, focus on digital learning and teaching.

Earlier in this paper, a range of educational theories and approaches to learning and teaching were discussed which highlighted the importance of **engagement** in the learning process - learning by doing. The following discussion on the findings from neuroscience on how the brain functions and learns, provides endorsement and validation for many of these theories, which advocate the importance of active and experiential learning, reflective practice, and learner-centred approaches.

Translating findings from neuroscience to improve learning and teaching

Advances in brain screening technologies over recent times have triggered renewed interest in neuroscience. Most continents have established Neuroscience or Brain Research Centres and use modern neuro-imaging and scanning technologies to capture, measure and analyse brain function. The focus of neuroscience research has largely been on medical research and the search for greater understanding of brain disease, injury, and malfunction. However, over the past decade or two, a handful of educators, many of whom also have backgrounds and training in neuroscience, medicine or psychology have been studying outcomes from neuroscience research, in pursuit of a better understanding of how to translate and apply these findings into sound educational principles and practice.

This paper is informed by a sample of scholars who are drawing on contemporary neuroscience to enlighten education practice including Doyle & Zakrajsek (2013), Hardiman (2010), Jensen (2008), Li et al (2020), Seegers (2020),Sousa (2011), Willis (2006 & 2007) and Zull (2002). Collectively, their pioneering works provide a treasure-trove of science-based ideas for engaging and supporting learners. The work of Brown (2010), a respected and experienced neuroscientist, is also valuable in terms of illustrating the importance of play for human development and mental-health. Ratey's (2008) work on brain science, is another worthwhile source of evidence, linking the importance of physical activity and exercise to learning.

Recent neuroscience research findings relevant to learning and teaching

Executive brain function- takes place in the pre-frontal lobe of the brain and provides the basis for the application of knowledge, higher order thinking skills and deep learning.

Brain Plasticity - ability to create and strengthen neural pathways.

Brain Pruning - cells that are not used are discarded.

Neurogenesis - ability to produce new cells.

Executive brain function - pre-frontal lobe of the brain.

Brain's limbic system – a set of structures in the brain that deal with emotion and memory, amygdala, hippocampus, thalamus, hypothalamus.

Learning and teaching framework informed by neuroscience

The following framework is based on the work of the scholars identified in this paper. The framework illustrates how information enters the brain through the sensors and under the right conditions progresses to the short term working memory and eventually the long term memory. The framework recognises barriers to learning as well as strategies which facilitate and optimise learning which in this framework are referred to as 'brain friendly' strategies or enablers.
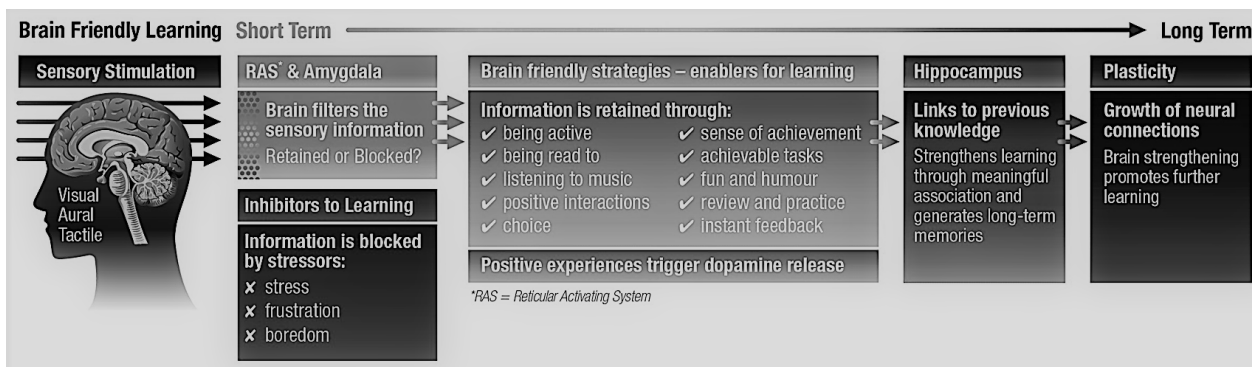
Figure 1: The role of the senses

We know from neuroscience that brain function initially relies on sensory information which enters the brain via the brain stem (Zull, p. 21), and (Jensen, pp. 53-92). Sensory information may be visual, in the form of text, images or pictures; auditory, delivered by sound such as someone speaking, singing or listening to music; olfactory, through smell; tactile, through physical touch or movement; or, a combination of these senses.

In any educational environment the initial challenge is to gain the learner's full attention (Hardiman, p. 12) and (Li & Zhou, 2020). It is necessary to optimise the impact of one or more of these senses to **engage** the student. Strategies such as using short, thought-provoking videos or YouTube clippings at the beginning of the session to generate interest and discussion is a popular technique with online educators. Activities, such as on-the-spot surveys, quizzes, or pop polls, are other techniques that can be used to quickly **engage** students. These interactions are improved if students respond instantly by using mobile phones and Apps such as *'Sophocles'*. This allows the lecturer to receive student responses in real-time and provide immediate feedback.

Minimising barriers to targeted sensory input

The work of Willis (2006, pp. 56-67) is particularly important with respect to engaging students in learning. She explains that when learners are subjected to overly stressful learning situations, the amygdala, part of the brain's limbic nervous system, shuts down. This reaction prevents sensory information passing into the memory connection and storage regions of the brain. In lay terms, this is often referred to as the 'freeze, flight or fight' response.

Other barriers to learning, identified by Willis (2007, p. 44) include boredom, confusion, and tiredness. Students often become bored and disengage, when the learning activity is either too difficult, or not challenging enough. Tiredness is a result of students not getting sufficient effective sleep to allow their brain and body to re-energise. Neuroscience confirms that during periods of sleep the brain consolidates memory connections from short term memory into long

term memory. This is where heavy duty thinking occurs in the form of problem solving, identifying patterns and relationships, and making judgements and informed decisions.

The author recognises that educational contexts vary across rich and poor countries around the world and that not all teachers and students will have ready access to digital devices. However, the proposition is that the principles of **engagement**, based on the neuroscience framework presented in the following section, are the key to effective online teaching and learning and that they should be foremost when designing and delivering curriculum.

Establishing a positive emotional and physical learning environment

Hardiman's (p. 27) *Brain-Targeted Teaching Model for the 21st Century*, promotes the importance of establishing a positive emotional climate for learning and the provision of a physical learning environment conducive to learning. For online learning, this means encouraging the learner to identify a comfortable, well lit, preferably dedicated space and time in which to learn. The resources a student needs to fully **engage** with the class online, must be clearly identified. These will include access to a digital device with the relevant software, a reliable internet connection, and possibly, use of a headset and microphone.

Designing relatable and enjoyable learning activities

We know from experience that if we enjoy what we are doing, we will stay with the activity for longer and seek to improve our skills and knowledge. When we experience even the smallest amount of success or satisfaction the limbic system of the brain releases a chemical known as dopamine, which makes us feel happy (Willis, 2007 p. 26 and pp.71-2). Educators need to provide learning experiences and activities, which stimulate the limbic system to release 'happy' feelings, in contrast to the amygdala's stress response, of shutting down brain activity.

The effective teacher aims to select topics and raise questions that are of interest to the learner so they can draw upon their existing knowledge and experience to create new knowledge and skills. Hardiman (p. 28) suggests that rather than focusing on shallow learning such as listing of facts, students are mentored in ways to use visualisation techniques to 'show' concepts and connections between new ideas and prior knowledge.

For online learners, visualisations can be as simple as capturing in a one-page diagram, brain-storming activities using words and images, or using mind maps, flow charts, graphs, or Venn diagrams, which illustrate relationships. The key is to 'hook' into something of interest to the learner so that they stay **engaged** and preferably share their ideas with fellow students

Providing sequential and attainable learning activities

The video game model is helpful in illustrating the importance of providing sequential and attainable learning activities. In a video game, the player starts at level one and by achieving all the tasks in that level gets to move to the next level, which provides slightly harder challenges. The reward is delivered through the release of dopamine in the brain every time the player reaches the next level. This feeling of positivity motivates the player to tackle more difficult levels (Willis, p.103).

For online learning this means that it is important to establish the student's current level of knowledge and skill, perhaps through a quick quiz, a crossword or multiple choice

questionnaire, and set learning activities which are attainable and still challenging. Sequencing learning activities so that they gradually become more difficult, like the stages in a video game, is important. The aim is to build upon prior knowledge and skills by providing layers of new knowledge and skills that can be integrated into existing stored memories.

Mastery

Hardiman (p.28 and pp.122-124) drew on the work of neuroscientists to highlight the importance of mastery in learning. Mastery involves not only absorbing new information but ensuring that the knowledge (memories) move beyond the short term memory of the brain and are laid down and stored in the long term memory of the brain, where they can be retrieved efficiently as required.

The concept of mastery provides endorsement for the educational theorist who promotes the importance of repetition, reflective practice, and active and experiential-based learning. The importance of mastery for learning requires diligent monitoring of the student's level of performance. Learning activities that allow for practice, repetition, memorisation and application of learned knowledge and skills are important to ensure that students have mastered and integrated the new content and skills. Educators need to be creative about the ways they encourage mastery and test for mastery.

The internet provides a wealth of online tools, software packages, Apps, interactive games, and crossword templates to assist with mastery of learning and to measure improvement in performance. '*Whack-a-Bone*' is an ideal revision and mastery App for students studying basic anatomy. Marketing simulation games enable teams of players to participate in a 'virtual marketplace' making decisions about products or services, inventories, budgets, target markets, and advertising strategies. Ideally, teachers need to select online learning activities which require knowledge and skills in problem solving, critical thinking, and recognising connections between discrete pieces of information.

Helpful and timely feedback

Most teachers and learners know the importance of regularly evaluating learning performance and getting helpful and timely feedback. If the feedback is immediate, the learner can process that memory or correct the memory on the spot. However, the longer a learner waits for feedback the more difficult it is to recall the memory or to correct the memory if the initial interpretation of the information or skill was incorrect. Understanding how memories are laid down in the brain and move from short-term working memory to long-term memory is complex. It depends on how the memory was created and what sensors were involved. For example, was the information conveyed in a lecture presentation with or without powerpoint slides? Was it presented in an illustration or video, read in a book, told to the learner by a friend or discovered through participation in an activity or physical task? Learners should be encouraged to identify learning '*prompts or aids'* to help them to remember and recall information. The ability to memorise key information and store and retrieve it as required, is an important underpinning for learning. Strategies such as word association, the development of metaphors, anagrams and grouping of information in graphic organisers are useful memory joggers (Willis, 2006, p.16).

A key to memorisation is how soon after the memory is created, it is reflected upon and reinforced. Research on 'Ebbinghaus Forgetting Curve' (Shrestha, 2017), suggests that within 20 minutes, learners will have forgotten an average of 40% of the information presented, within 24 hours, they will have forgotten an average of 65% of new information, and within a week, an average of 80%. The opportunity for spaced repetition is also important as it gives the brain time to lay down the learning as long-term memories. Advocates of the 'forgetting curve' suggest that it is more effective to repeat new learning ten times over the space of a week, than twenty times in the period of a day. Doyle & Zakrajsek, (2013, p. 7) link this notion to the theory of distributed learning.

Another important aspect of providing effective feedback and creating sustaining memories relates to how much new information is provided at one time. Research suggests that once a learner is required to learn more than seven bits of new information in one session, they are likely to experience *'cognitive overload'* (Sweller, 2011). The concept of cognitive overload links to the earlier discussion on stress, where the amygdala *'shuts off'* and prevents the brain from receiving or processing any new information. Effective teachers try to avoid cognitive overload by *'chunking'* information into logical parts enabling the brain to work with small bits of information at a time.

The provision of accurate and useful feedback is also important for effective learning. Instead of limiting feedback to a brief *'good work'* comment, teachers need to provide more targeted feedback such as *'good work, because you used specific case studies and examples to support your argument'* and instead of *'not up to standard'*, a statement such as *'to improve your essay you could refer to current research on the topic'.*

The key messages for digital learning related to feedback is to take advantage of the available technologies to convey information, encourage repetitive practice, create memories and provide timely and accurate feedback. Some learners find digital learning journals are a useful way to capture their learning and feedback. Some teachers make personalised video clips, which provide verbal feedback to groups or individual students. The videos are easy to prepare and do not need to be professionally produced. The goal is to provide students with some useful strategies to improve their learning as quickly and efficiently as possible.

Working in groups and peer learning

Brain scans reveal increased activity when learners interact with other learners. This evidence points to the importance of peer-to-peer **engagement**, group work and collaborative learning activities (Zull, p. 238) and (Willis, 2006 p. 159).

Digital learning creates some difficulties for group interactions due to the lack of physical closeness. However, many of the new digital tools also provide some exciting opportunities for student interaction and collaboration on projects. Features such as 'Chat Room' available on most LMS provide opportunities for small group discussion and sharing. Software and Apps such as Facetime, Zoom, Skype and WhatsApp enable students to establish group forums. In addition, there are several online project management tools and templates which help groups design and implement project plans and record their progress and outcomes. The challenge for the curriculum designer is to set interesting and practical projects and group work.

It is critical that group work undertaken through digital learning is underpinned by respectful and ethical policies and protocols. Regular group meetings need to be scheduled, and students given specific tasks to undertake and report upon each session.

Acknowledging and celebrating achievements

Willis (2007, p. 20), stresses the importance for learning of acknowledging achievements, even if the progress is quite small. She refers to the evidence from brain science where a learner experiences a *'feel good'* moment when praised or rewarded for their good performance.

For digital teaching and learning this means that opportunities to acknowledge positive performance and celebrate success need to be consciously built into courses. This could be by providing opportunities for students to share online their photographs, posters or visual work through online exhibitions and mini seminars.

Creativity

The brain responds positively to activities which are innovative and encourage creativity. Exposure to art, literature and music, record increased brain activity and contribute to strengthening and quickness of neural activity (Hardiman, pp. 13-16) and (Jensen, pp. 78-79).

The digital world provides an abundance of opportunities for learners to engage in art, literature, and musical pursuits. Teachers need to think laterally about interesting ways to integrate these creative activities into their teaching. Some suggestions include providing students with choice, such as opportunities to present photographs, powerpoint presentations and videos to document their learning. Taking virtual tours of art galleries and museums and listening to online musical performances and theatre, expose learners to artistic works and stimulate learning and development. It may require some innovative thinking to weave these experiences into curriculum, but the effort is worthwhile. Providing assessment tasks for online learners, such as designing a digital poster usually *'Glogster', 'Canva'* or similar software, developing a video story-board or 4 slide power point presentation, challenge learners to think creatively about how to consolidate and demonstrate their learning and helps prepare them for work-ready activities.

Physical activity

The importance of movement and physical activity in the learning process has been advocated by play, health, and physical education experts for many years. According to Ratey, *'Exercise cues the building blocks of learning in the brain'* (p. 4). Brown's (2010) research on the importance of play for adults is particularly revealing in terms of human development and mental health. Neuroscience findings confirm the belief that physical activity builds strong brains by *'strengthening connections between your brain cells, creating more synapses to expand the web of connections, and spurring newly born stem cells to divide and become functional neurons in the hippocampus'* Ratey (p. 237).

The innovative digital curriculum designer ensures that there are integrated opportunities for learners to **engage** in physical activity, to move around inside or outside perhaps undertaking research or collecting data. The need to disperse intensive, sedentary periods of learning and

study with physical exercise also needs to be considered when planning lectures and deciding on the length of examinations.

It is helpful to refer to the educational theorists who promote active and experiential learning when designing digital learning activities which promote physical activity.

Sleep and rest

Brain science reveals that many memories are consolidated when we are asleep (Doyle & Zakrajsek, pp. 30-31), (Hardiman, pp. 14-15) and (Sousa, pp. 107-110). The brain needs this quiet time to *'catch up'* and to *'mentally file'*, the day's activities. Willis (2006 p. 36), refers to sleep as a time *'to consolidate and cement'* new knowledge and experience to memory. Learners often find that a problem they were grappling with at the end of the day, is clearer the next morning, after a good night's rest. This '*down time'* is sometimes referred to as an *'incubation'* period, where the brain needs time to sort out the bits of the puzzle and make sense of them.

For digital learning and teaching the messages are the same as face-to-face education. They include getting adequate periods of sleep, avoiding cramming before examinations, taking regular breaks, especially from screens and sitting for long periods of time and balancing bursts of high energy output with periods of rest and recovery.

Conclusion

This paper provides a framework for designing and delivering effective digital learning and teaching informed by contemporary neuroscience on brain function and how learning occurs in the brain. The framework also links to, and provides affirmation for, popular educational theories which reinforce the importance of **engagement** in learning and teaching.

The urgency and importance of providing this framework, embedded with practical online strategies for **engagement** with remote learners, was intensified with the rapid spread of the COVID-19 pandemic in early 2020, which resulted in world-wide restrictions and embargoes on face-to-face education.

Whilst, it is acknowledged that learning contexts vary world-wide and that developing and poor nations do not have ready access to many of the digital resources available to richer countries, the fundamental principles of **engagement** outlined in the neuroscience learning and teaching framework discussed in this paper, are relevant to all levels of online delivery.

A final reminder for educational leaders and decision-makers is that digital learning and teaching should not be driven by technology, but instead, draw upon and select technologies which support the evidenced-based educational concepts outlined in this framework and the context in which the learning is taking place.

The success of this approach will be highly contingent upon the time and resources allocated to staff professional development and training (Seegers, 2020), and the relevant strategies put in place to support student use of digital technologies for learning.

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The COVID-19 Pandemic Impact on the Internationalisation of a South African Business School

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Abstract

The internationalisation of higher education is a dynamic process, continuously shaped and reshaped by the international context in which it occurs. Internationalisation is the process of integrating an intercultural and an international dimension into the purpose, functions or delivery of higher education. Higher Education Institutions (HEIs) globally have realised the benefits of internationalisation. It is a priority for many HEIs, driven largely by the recognition that quality teaching and research must be international in outlook and practice. In spite of the increase in the rhetoric of internationalisation, the concrete aims and actions related to internationalisation taken by HEIs vary.

Research has identified various factors that influence internationalisation at HEIs. A quantitative survey was conducted amongst Nelson Mandela University Business School students and Alumni to determine the factors that influence the students' perceptions of the internationalisation of the Business School. Six factors were identified in the study, including the factor, COVID-19. The results for the COVID-19 factor are presented in this paper. The data were statistically analysed using descriptive statistics and exploratory factor analysis. The findings from 129 respondents indicated that the COVID-19 pandemic had an impact on the internationalisation efforts of the Business School. The respondents indicated that they would accept international students and academics back into the Business School after the COVID-19 pandemic, however with health precautions in place. The contribution of this paper is to provide Business School management with statistical evidence on the students' views on the impact the COVID-19 pandemic on the internationalisation efforts of the Business School.

Keywords: Internationalisation, Business Schools, Students, COVID-19

Introduction

In the last two decades, terms such as student and academic exchange and mobility have become part of the everyday language in the academic environment. This includes the mobility of lecturers, researchers, students and educational programmes (Terzieva, 2018). Internationalisation is an integral part of a continuous process of change in higher education (Huang & Daizen, 2018). The National Association of Foreign Student Advisers (NAFSA) define internationalisation as 'the conscious effort to integrate and infuse international, intercultural

and global dimensions into the ethos and outcomes of postsecondary education' (NAFSA, 2018). The internationalisation of higher education (HE) is a dynamic process, continuously shaped and reshaped by the international context in which it occurs. It is a priority for many institutions and countries, driven largely (but not entirely) by the recognition that quality teaching and research must be global in outlook and practice (Green, 2014). In spite of the increase in the rhetoric of internationalisation, the concrete aims and actions related to internationalisation taken by higher education institutions vary (de Wit & Engel, 2015).

Terzieva (2018) notes that there are many dimensions to internationalisation. These firstly include the political dimension, which ensures the retention of the national profile and international status through comparability. Secondly, growth and competitiveness, which are economic issues such as the labour market and employability. Thirdly, the social and cultural issues of massification, cultural understanding and the dissemination of language and culture. The last dimension is academically related, where academic vision, institutional capacity, curriculum and management systems, HE quality and world-class universities play a role. African universities have engaged in internationalisation primarily for academic purposes. The aim was to strengthen existing academic institutions and enhance research capacities as well as knowledge production (Teferra, 2008; Ramtohul, 2016).

Today, the terms 'world economy', 'world market internationalisation' and 'globalisation' are commonplace even in the world of education. Over the past 600 years, people of the world became linked to one modern world system with the focus today on how local, regional and national entities are integrated into this system (Chase-Dunn, 1999). According to the world system's perspective, the world is an integrated system comprising a central Western zone and a peripheral zone, both of which operate in a competitive, global education environment. The world system's perspective is also associated with the export of MBA qualifications to developing countries (Allahar & Sookram, 2018; Blass, 2009; Spring, 2008). The reality is that higher education systems are located either at the centre or periphery of the global higher education landscape in terms of international student recruitment and knowledge generation (Aziz & Abdullah, 2014).

The growing attention to internationalisation in the academic literature, has also initiated the growth in internationalisation of education as a business (de Wit & Engel, 2015). Internationalisation has benefits for universities and HE. These include improved quality of teaching and learning as well as research; deeper engagement with national, regional and global issues and stakeholders; better preparation of students as national and global citizens; access for students to programmes that are unavailable or scarce in their home countries; enhanced opportunities for faculty improvement and, through mobility, decreased risk of academic 'inbreeding' (Huang & Daizen, 2018). However, Ramtohul (2016) comments that African countries, including Mauritius, need to monitor internationalisation so that the local institutions are strengthened and stand to benefit from this global outreach and are not left weaker. De Wit (2011) notes that internationalisation is not an aim in and of itself; it is a mechanism for improving the overall quality of education.

Prior to the outbreak of the COVID-19 virus, there has been limited research conducted on the impact of pandemics, such as COVID-19 on internationalisation. However, since then, there has

been some scholarly research conducted on the impact of COVID-19 on education (Sahu, 2020), however limited studies on its impact on internationalisation. The aim of this paper was to determine the COVID-19 pandemic impact on the internationalisation efforts of the Nelson Mandela University (NMU) Business School, from a student's and Alumni perspective. The results reported in this paper form part of a larger study investigating the factors that affect the internationalisation of the NMU Business School (Figure 1).

The research problem investigated in this study was that the NMU Business School management do not know what the COVID-19 pandemic impact is on the internationalisation efforts of the NMU Business School, as seen from a student's and Alumni's perspective. The paper, in the literature background, identifies possible COVID-19 related factors that can impact the internationalisation efforts of the Business Schools. This is followed by the Research Methodology, a discussion of the results and finally conclusions and future research recommendations.

Literature Background

Mohamedbhai (2020) argues that COVID-19 will leave no sector in any country in the world unaffected and its consequences will be felt for years to come. At a time when efforts are being deployed to transform and improve higher education in Africa, there is a danger that COVID-19 will destabilise the sector, with serious consequences. The COVID-19 pandemic has come with many uncertainties for the higher education sector and for internationalisation and mobility. Waruru (2020) quotes Professor Alabi, who asks whether conditions such as vaccination compliance will be imposed on African students wanting to study abroad.

Most of Africa's 54 countries have confirmed cases and fatalities due to COVID-19 (Tamrat & Teferra, 2020) and like many countries worldwide, the South African government implemented a national curfew. Arguably, it has been described as one of the strictest globally. This has resulted in people and companies, as well as Higher Education Institutions (HEIs) trying to find innovative ways to organise everyday life and work in response to the global crisis caused by the COVID-19 pandemic and ever-increasing restrictions (Chasi, 2020). Since South Africa recorded its first confirmed case of COVID-19, universities have undergone totally unanticipated changes in the way they operate and in the way they deliver the academic programme. HEIs across the continent are setting up institution-wide task forces to mitigate the impact of the pandemic. These initiatives involve participating in high-end research towards finding a cure for the virus. Many HEIs are attempting to shift to online teaching and learning through institutional, national, continental and international initiatives (Tamrat & Teferra, 2020).

Naidu (2020) argues that some of the potential consequences from the coronavirus pandemic that affect higher education in Africa are diminished high-level research funding and less face-to-face conferences and collaboration. The QS survey (QS, 2020) on internationalisation indicates that 53% of respondents now intend to delay or defer their study in another country and only 9% intend to study in a different country. Furthermore, the findings indicate that only a small minority of 7% now no longer want to study overseas. This suggests that the market for international students is still strong, which is supported by Ogden, Streitwieser and Van Mol (2020), who propose that the pandemic has potential opportunities. The following sub-sections

will discuss the impact COVID-19 has on internationalisation as well as opportunities presented by the pandemic.

Impact on international students and staff

In the early days of the world COVID-19 crisis, concerns were raised that focused primarily on the disruption that the COVID-19 pandemic would bring to student mobility (Tamrat & Teferra, 2020). The short-term implications of this global pandemic include universities affected by restrictions on travel, including international travel by students and staff (Chasi, 2020). This resulted in some students changing their plans to study abroad (Mitchell, 2020). Consequently, the enrolments of international students, who would normally be preparing for an international exchange, have significantly decreased (Ogden et al., 2020). Students have required dedicated assistance from often overworked and under-resourced internationalisation professionals at host and home institutions, in collaboration with relevant ministries and diplomatic missions (Chasi, 2020).

Impact on technological infrastructure

Nganga, Waruru and Nakweya (2020), as well as Tamrat and Teferra (2020), argue that HEIs have turned to online teaching to ensure students finish their courses on time, however institutional preparedness varies from one institution to the next. This is because of inequalities such as poor infrastructure, lack of power and power interruptions, technological limitations, insufficient experience to deliver whole curricula online, exorbitant costs and no equal internet access (Ogden et al., 2020, Tamrat & Teferra, 2020; Mohamedbhai, 2020). In South Africa, both internationalisation and COVID-19 have the potential to entrench existing inequalities further (Chasi, 2020). However, in a bid to assist students who fail subjects during the COVID-19 crisis and have struggled with disruptions and the transition to online learning, some HEIs have opted to grant an academic amnesty to these students (The Sydney Morning Herald, 2020). Other universities have opted to collaborate with Internet providers and governments whilst others have decided to offer data bundles to their students and staff.

Despite the technological challenges faced by universities, this threat may be the stimulus needed for long-lasting changes in African higher education to increase the capacity to work, teach and learn remotely in the shortest possible time (Tamrat & Teferra, 2020; Chasi, 2020). It may also see useful innovations that can help guide future teaching (Nganga et al., 2020). Amongst others, a diversified means of educational delivery, in particular a non-residential model may become more mainstream, more acceptable and more respectable (Tamrat & Teferra, 2020).

Impact on quality of online education

In order to succeed in dealing with global competition, changing demands of students and expectations, emergence of technological challenges as well as requirements of business and industry, HEIs are shifting their focus towards teaching quality (Elçi, Yaratan & Abubakar, 2020). Online teaching is not a new method of delivery for HEIs (Sahu, 2020) and most universities have turned to this form of delivery because of the restrictions placed by many governments due to COVID-19 pandemic. Generally, educators have had little time to prepare sufficiently for online

education. This has had an impact on the quality of programmes that have been prepared online (Mohamedbhai, 2020). A professional instructional designer who prepares the teaching material for a lecturer, who is instructionally trained, is required for quality online learning (Mohamedbhai, 2020).

Impact on funding

Higher education authorities in Africa have been warning the institutions over budget shortfalls, which have left them unable to meet their immediate financial obligations (Nganga et al., 2020). Due to the COVID-19 pandemic, many governments are prioritising the health sector to minimise contagion and limit deaths. They are also trying to assist the socially disadvantaged of their population. As a result, funding for high-level research, as well as face-to-face conferences and collaboration, will be diminished (Naidu, 2020). Therefore, recovery and support for other sectors of the economy, such as the higher education sector will have to come later. Universities have been faced with massive losses in revenue even after shifting learning online (Waruru, 2020).

Opportunities for internationalisation of higher education

The COVID-19 threat provides an opportunity for HEIs to involve employers actively to assist graduates to improve skills needed to gain employment, such as communication skills, taking personal initiative and working in a team (Mohamedbhai, 2020). Elçi et al. (2020) emphasised that COVID-19 has highlighted the importance of achieving quality in HEIs. African universities need to offer life-changing and perspective-deepening experiences that would cause them to attract international students (Hinson, 2020). The COVID-19 pandemic may accelerate changes that have already been in motion for some time. This could be reflected in evolving international partnerships in the possible forms of global gateway campuses and international branch campuses in collaboration with online programme management providers. Virtual exchange alliances could offer students access to intercultural, international classrooms (Ogden, Stretweiser & van Mol, 2020).

Research Methodology

This study followed a positivistic research philosophy and the approach was deductive. The objective of this paper is to investigate the impact of the COVID-19 pandemic on the internationalisation of the NMU Business School, from the perspective of current Business School students and Alumni. The research study was conducted during Level five of the lockdown in South Africa in 2020, using a convenience sampling technique to address the research question: What are the Business School students' perspectives on the internationalisation of the NMU Business School during and after the COVID-19 pandemic?

An online questionnaire was distributed to all PDBA and MBA students currently enrolled at the Nelson Mandela Business School, as well as Alumni. The students completed the online questionnaire using QuestionPro, the NMU survey tool. The survey request was sent to 300 students and 129 fully completed responses (43% response rate) were finally received. The fact that the link to the questionnaire was sent during Level five of the lockdown could explain the low response rate. Level five lockdown restricted the movement of citizens, closed businesses, except for essential services and had a 8pm curfew.

The survey included nine statements ranked on a 5-point Likert scale on level of importance (1 – Strongly Disagree to 5 – Strongly Agree) relating to the COVID-19 factor. The data analysis was conducted with the assistance of the NMU Research statistician, making use of the statistical package, Statistica. Descriptive and inferential statistical analyses were conducted, including Exploratory Factor Analysis (EFA). General descriptive statistics and ANOVA two sample t-tests were also used to compare the results between different groups of students surveyed.

The NMU Business School's internationalisation conceptual model is presented in Figure 1. The factor COVID-19 was included in the model to determine the impact of the pandemic on the internationalisation of the NMU Business School and is reported in this paper.
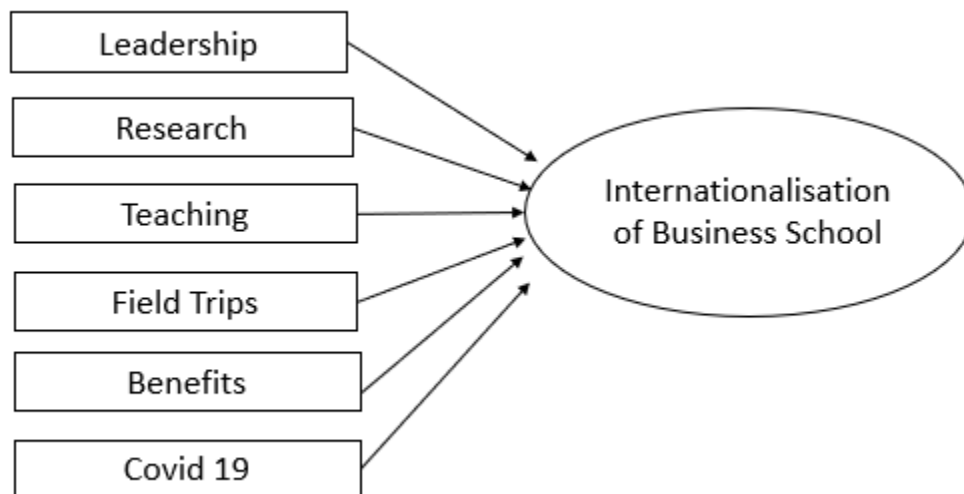
Figure 1: Internationalisation Conceptual model

Results

Table 1 shows the frequency distribution of the responses that the highest number of respondents (n = 68, 53%) were in the age range of 30 - 39 years. This is followed by the age range of 40 - 49 years (n = 34, 26%). The majority of respondents were male (n = 75, 58%). The respondents were requested to indicate whether they were PDBAs, MBAs or MBA Alumni. Thirty respondents (23%) were PDBA students, 58% (n=74) MBA students and 19% (n=25) were MBA Alumni. Eighty-four percent of the respondents (n = 109) held a valid passport.

Table 1: Frequency distribution of demographic variables

Frequency distribution gender			Frequency distribution age	
Male	75	58%	18-29	18 (14%)
Female	54	42%	30-39	68 (53%)
Total	129	100%	40-49	34 (26%)
			50-59	8 (6%)
			60+	1 (1%)
			Total	129 (100%)
Frequency distribution academic status			Valid passport	
PDBA	30 (23%)		Yes	109 (84%)
MBA 1st year	41 (32%)		No	20 (16%)
MBA 2nd year	33 (26%)		**Total**	**129 (100%)**
Alumni	25 (19%)			
Total	129 (100%)			

Table 2 indicates the responses to the nine statements related to the factor COVID-19. The results for the responses for Strongly Disagree/Disagree and for Strongly Agree/Agree were combined for ease of interpretation (Table 2). One hundred and three respondents (80%) agreed that they will still travel internationally after COVID-19 is over and nine percent of respondents (n = 11) disagreed with this statement. Eighty-five percent of respondents (n =110) agreed that international students should be allowed to study in South Africa after COVID-19 pandemic. However, sixteen respondents (12%) had a neutral response to this statement. Eighty percent of respondents (n = 103) agreed that pandemics such as COVID-19 are accelerated by international travel. However, fourteen respondents (11%) had a neutral response to this statement.

Table 2: Univariate ANOVA Results - COVID-19

Questionnaire Item	Disagree		Neutral		Agree	
	n	%	n	%	n	%
I will still travel internationally after COVID-19 is over	11	9%	15	12%	103	80%
International students should be allowed to study in SA after COVID-19	3	2%	16	12%	110	85%
Pandemics like COVID-19 are accelerated by international travel	12	9%	14	11%	103	80%
I will have to travel internationally for work after COVID-19	51	40%	29	22%	49	38%
I will only travel to COVID-19 safe countries	50	39%	28	22%	51	40%
Health is equally important to safety and security	1	1%	3	2%	125	97%

International visitors pose a risk	30	23%	33	26%	66	51%
International visitors should be tested on arrival in SA	4	3%	2	2%	123	95%
International academics should be allowed to teach at SA universities after COVID-19	3	2%	11	9%	115	89%

Forty percent of respondents (n = 51) disagreed that they will have to travel internationally for work after COVID-19 and forty-nine respondents (38%) agreed with the statement. Forty percent of respondents (n = 51) agreed that they will only travel to COVID-19 safe countries. Whilst fifty respondents (39%) disagreed that they will only travel to COVID-19 safe countries, twenty-two percent of respondents (n = 28) had a neutral response to this statement. Furthermore, a significant majority of respondents (n = 125, 97%) agreed that health is equally important to safety and security.

Sixty-six respondents (51%) indicated that international visitors pose a risk. However, thirty respondents (23%) disagreed with this questionnaire statement, whilst the remaining thirty-three respondents (26%) had a neutral response to the statement. Ninety-five percent of respondents (n = 123) agreed that international visitors should be tested on arrival in South Africa. The majority of respondents (n = 115, 89%) agreed that international academics should be allowed to teach at South African universities after the COVID-19 pandemic.

Figure 2: Responses to the factor COVID-19 statements

In summary, the respondents agreed that COVID-19 has had an impact on internationalisation. The respondents agreed with the statement that *health is equally important to safety and*

security (Figure 2). Although respondents agreed that they will still travel internationally after COVID-19 is over, the respondents acknowledge that pandemics like COVID-19 are accelerated by international travel and as a result agree that international visitors should be tested on arrival in South Africa.

The univariate ANOVA analysis was conducted on the independent factor of COVID-19, the results of which are presented in Table 3. The results indicated Gender to be statistically significant (p = 0.018) with a small practical significance, as indicated by Cohen's d = 0,47 (Table 3). Respondents holding a Valid Passport differed from respondents with no passport as this variable was statistically significant (p = 0.010) with a medium practical significance (Cohen's d = 0,71).

Table 3: Univariate ANOVA Results - COVID-19

Effect	F-value	D.F.	p	Cohen's d
Gender	*5,79*	*1; 121*	*,018*	*0,47 (Small)*
Age	0,41	2; 121	,666	n/a
Status	0,80	3; 121	,495	n/a
Valid Passport	*6,94*	*1; 121*	*,010*	*0,71 (Medium)*

Table 4 indicates there is a statistical and practical statistical difference between the mean values for the demographic variables *Gender* as well as *Valid Passport* for the respondents in this study.

Table 4: Post-hoc Results - COVID-19

Effect	Level 1	Level 2	M_1	M_2	t-Test p	Cohen's d
Gender	Male	Female	4,09	3,75	,018	0,47
Valid Passport	Yes	No	4,03	3,51	,010	0,71

Eigenvalues and the percentage of each construct, which can be explained by a single factor, are presented in Table 6. The items that are loaded for the COVID-19 factor are presented together with the percentage of variance explained (Table 5). The factor loadings of greater than 0.300 were deemed significant at α = 0.05 significance in accordance with the recommendation for sample sizes greater than 120 (Hair et al., 2010). The EFA on the factor COVID-19 highlighted three factors as indicated by the Eigenvalues (Table 5) and one factor indicated by the Scree Plot (Figure 3). The factor loadings for the nine items included in the EFA for the COVID-19 factor are illustrated in Table 6 and explain 28.2% of the total variance.

Figure 3: Screen Plot - COVID-19 (n = 129)   *Table 5: EFA Eigenvalues - COVID-19 (n = 129)*
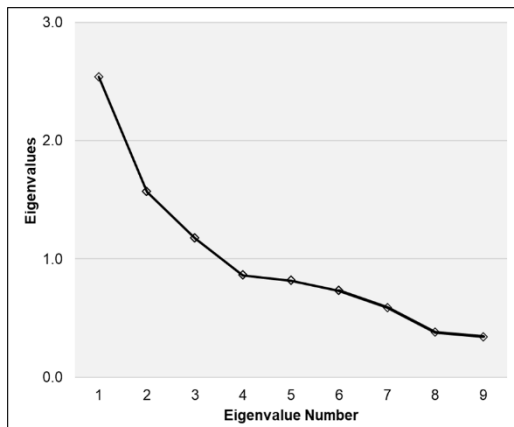
Factor	Eigenvalue	% Total Variance	% Cumulative Variance
1	2.538	28.2	28.2
2	1.566	17.4	45.6
3	1.174	13.0	58.6
4	0.862	9.6	68.2
5	0.817	9.1	77.3
6	0.730	8.1	85.4
7	0.589	6.5	92.0
8	0.381	4.2	96.2
9	0.343	3.8	100.0

Table 6: Exploratory Factor Analysis (EFA) Loadings (1 Factor Model) – COVID-19 (n = 129)

Item	Factor 1
1. International students should be allowed to study in SA after COVID-19	**,810**
2. I will still travel internationally after COVID-19 is over	**,807**
3. International academics should be allowed to teach at SA universities after COVID-19	**,798**
4. I will have to travel internationally for work after COVID-19	**,526**
5. International visitors pose a risk	**,486**
6. Pandemics like COVID-19 are accelerated by international travel	,219
7. I will only travel to COVID-19 safe countries	-,134
8. Health is equally important to safety and security	,089
9. International visitors should be tested on arrival in SA	,085
Percentage of Total Variance Explained = 28.2%	

An additional EFA was conducted and the items with non-significant loadings, namely items 6 to 9, were omitted. A one-factor model (Table 7) was finally indicated by both the Eigenvalues and the Scree Plot with five items. The Cronbach's Alpha coefficient for the COVID-Factor (n=129) was 0.72, indicating *Good* reliability.

Table 7: Exploratory Factor Analysis (EFA) Loadings (1 Factor Model) – COVID-19 (n = 129)

Item	Factor 1
2. I will still travel internationally after COVID-19 is over	**,814**
1. International students should be allowed to study in SA after COVID-19	**,805**
3. International academics should be allowed to teach at SA universities after COVID-19	**,804**
4. I will have to travel internationally for work after COVID-19	**,531**
5. International visitors pose a risk	**,494**
Percentage of Total Variance Explained = 49.7%	

Conclusions

HEIs internationally have benefitted and participated in the growth of the internationalisation of education (de Wit & Engel, 2015). Withanachchi (2018) indicates that any international experience will positively affect an individual in their career. The benefits of internationalisation include improved quality of teaching and learning, international research, access for students to programmes that are unavailable or scarce in their home countries, inter-cultural exposure and exposure to international faculty and students (Huang & Daizen, 2018).

The results indicate that Business School students support the international movement of students and academics; however, health standards and screening must be maintained. The respondents were divided on their response to whether they would only travel to COVID-19 safe countries, 39% disagreed and 40% agreed with the statement. A statistical and practical difference were recorded for males and females (f=5,79, p=0,018, Cohen's d= 0.47) and respondents with a valid passport (f=6.94, p=0,010, Cohen's d=0.71) on their responses to the COVID-19 statements. Males and respondents with a valid passport were more strongly in agreement with the survey items. The EFA reduced the statements relating to the COVID-19 factor from 9 to 5 statements, explaining 50% of the variance for the COVID-19 factor.

Although the pandemic and quarantine arrived without warning and educational institutions had to adapt quickly to ensure academic continuity, advantage must be taken of this crisis to pause, analyse and reflect and then rethink education and internationalisation (Delgado, 2020). The contribution of this study is that it is the first study, conducted among Business School students, on the impact of the COVID-19 pandemic on the internationalisation of a Business School. The limitations of this study are that only 43% of the population responded to the invitation to complete the questionnaire. Future research will evaluate the factors affecting internationalisation of the NMU Business School, post COVID-19 pandemic.

Declaration Of Conflicting Interests

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MauriLearn: Towards the Design of a Learning Management System for secondary schooling

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Abstract

There is no doubt that the global education sector has experienced a recent paradigm-shift in education due to the outbreak of the novel coronavirus (COVID-19). In Mauritius, all educational institutions remained close to avoid the spreading of the virus and to ensure safety of students. As such, many schools are moving towards collaboration tools such as WebEx, Zoom, Skype or Office 365 to conduct online classes. However, these IT platforms are more business-meeting oriented, lacking the suitable features to support pedagogical activities of students and teachers. In this paper a locally tailor-made Learning management system: MauriLearn: https://www.maurilearn.com/ is developed for the needs of assisting around 108,562 secondary students and 8,813 teachers in Mauritius. A Learning management system (LMS) is an E- platform or software used to plan, manage, and evaluate the learning progress of learners. The features of LMS vary considerably but certain core functions involve administration roles such as: student and teacher registration, file handling: upload course materials and videos, course assignments, quiz scores, digital certificate upon course completion. The aim of MauriLearn is to provide a fast-virtual alternative to collaboration tools during this unprecedented COVID-19 period. MauriLearn comprises only the core functions of an LMS and supplementary features such as teleconferencing, bulk email transactions or live-chat system are yet to be implemented. Python programming language and flask framework was used during the software development of the LMS. The E-platform has been tested with a pool of students and teachers and consequently, the simple layout design and functions allows users to effortlessly navigate the E-platform and carry out learning tasks with minimal hindrances. Additionally, MauriLearn can be used for the post COVID-19 period in a blended learning method (face to face session and online classes).

Keywords: COVID-19, Learning Management System, E-Platform, Software development, Secondary schools, Mauritius, MauriLearn

Introduction

Technology denotes the engineering process where new strategies are created and is claimed as an essential tool to assist teaching and learning and contribute to learner's accomplishment. (Umugiraneza et al., 2018). Learning Management System (LMS) has gained undivided attention in this modern era of technology where interactive visualization and integrated E-learning tools (Krajcik and Mun, 2014) are now ruling the educational system (Dalton, Liu, 2010) to connect both instructors and learners together. Similarly, it is beneficial for educational institutions where educators can deploy their teaching courses online and contribute to their abilities to teach. Many schools have embedded new technologies in their learning curriculum to support pedagogic activities as noted by Oliveira et al. (2019). Notably, such IT solutions facilitate teachers and students to synchronize educational activity, social interaction, and knowledge construction (Gershon, 2017). This has increasingly shaped educator and students experiences as stated by Gershon (2017). Thus, many school systems have implemented advanced technologies into the educational process to ease the work of educators and students and at the same time to make an amendment in their attitudes and show their willingness to teach and learn using technology. Technological tools and applications play a substantial role in enhancing learning as well as teaching. Technology can thus change the teaching environment allowing teachers to prepare lesson plans, design learning activities and conduct assessments more effectively (Umugiraneza et al., 2018). A study by Appavoo (2020) indicates that Mauritius is also keen in integrating technology in its school curriculum. Secondary students recognized the usage of technology as being effective and as having the capacity to influence learning (Appavoo, 2015). It is noteworthy that several researchers have pointed to the educational potential of E-learning tools including LMS (Malm & Defranco, 2012; Han & Shin, 2016). It leads to an expansion of opportunities to partake, cooperate, discover as well as share information and learn together which result in better learning (Lonn, 2009).

A Learning Management System (LMS) provides the anywhere-anytime learning virtual platform through the internet. This is the package of a Management information system that makes the provision of learning materials, tools and events, and handling of similar roles of management (Mahoney & Cameron, 2008). In line with this, a continuous improvement of E-learning undoubtedly embraces a wide array of educational instruments and techniques which help fit the requirement of teaching staff. Furthermore, E-learning offers a great opportunity for students to follow online courses independently and self-regulate (Cavus, 2013). As expressed by Geduld (2019), self- regulated learning in an educational environment increases success in problem-solving, academic achievement, and promotes underlying motivation. A Learning management system, similarly, recognized as a course content management system, is now a critical element of the virtual toolkit of every large organization or educational establishment. A high quality LMS includes the following attributes namely, a familiar computer - based learning experience helps learners to learn straight on each new e-course they are signing up for as well as the most useful pieces of software are those that can be configured to function as desired. Additionally, there is no need to copy and paste contact data or switch among two digital systems, all course correspondence and updates could be performed from inside the LMS scheme. The features of LMS vary considerably but certain core functions are designing of

learning-content, monitoring of skills, synchronous learning explained as the learners' capacity to finish the course works within their own speed, gamification, video teleconference, experience learning socially, digital certification upon completion of a course and lastly electronic business and subscriptions. Within an educational context, instructors value the ability to customize the e-learning material from anywhere and at any specific moment in time for the workshop or class as often as necessary.

The recent outbreak of the novel coronavirus, COVID-19 has greatly affected the landscape of the education sector. According to the UNESCO Institute for Statistics, the outburst of the COVID-19 virus has led to the closure of educational institution in 188 countries, affecting more than 1.5 billion students and 63 million primary and secondary teachers worldwide ("Take a Survey: COVID-19 and Early Childhood Education Workforce", 2020), Mauritius is of no exception. All academic establishments were forced to close on the 19th March 2020 to avoid propagation of the virus ("Republic of Mauritius- 3 cases of COVID-19 reported in Mauritius", 2020). As at March 2019, the country provides education to 85,730 primary students, 108,562 secondary students and 47,398 tertiary students respectively ("Statistics Mauritius - Education Statistics - Year 2019", 2020). The COVID-19 crisis has necessitated the shift from physical classroom to virtual solutions. As such in Mauritius, many schools and educators are moving towards collaboration tools such as WebEx, Zoom, Skype or Office 365 to conduct online classes. However, these IT platforms are more business-meeting oriented and do not necessarily have all the features to support pedagogical development. The purpose of this paper is to model a tailored Learning management system namely MauriLearn with suitable characteristics to support the learning development of secondary students in Mauritius. The Learning management system supports three roles: school administrators (Admins), teachers, and students.

- To gain access to the LMS, one needs to have a valid email address and password that will be provided by the school administrators. Admins will also be responsible to manage the students, teachers and customize the LMS according to the school's name and logo.
- Teachers can view profile pages, create subjects detailing the chapters, upload learning resources such as videos, documents, and homework, create internal quizzes, correct homework, and approve digital certificates.
- Students can view profile pages and statistics, view the learning path as per their grade, subscribe to different subjects, access learning resources, attempt internal quizzes, upload homework, and obtain digital certificates upon completion of subjects.

MauriLearn is an adaptive, web-based Learning management framework designed for the secondary schooling system in Mauritius. The intent of this E-platform is to provide a rapid and free solution to sustain student's education during the confinement period in the country due to the novel coronavirus. The LMS MauriLearn is tagged as "Made in moris" which is a concept that values local products stemming from Mauritian knowledge and authenticity. MauriLearn is limited to the core features of an LMS and does not have additional features such as teleconferencing, chat system or bulk email transaction onto the platform.

Literature Review and Related work

Learning management system (LMS) is an eLearning software, platform or website which systematizes the function of training and teaching proceedings within an educational institution or any organization. Such E-platform helps educational institutions to define and manage their curriculum contents using gamification mechanisms such as badges, scorecards, or digital certificates displayed on the user's profile page (Shamsuddin et al., 2018). LMS have several supplementary functions such as administration of learning- programs where students can access all required learning materials and resources on a singular platform, have the possibility to attempt internal assessments, and to communicate with teachers via discussion chats and emails (Dobre, 2015). The very first usage of LMS was in 1995 where the University of British Columbia developed WebCT. The development of this online E-platform was inspired by research which suggests that academic performance can be improved by provision of web-based resources. WebCT was widely used globally with over 10 million users in 80 countries (Turnbull, Chugh, & Luck, 2019). Instructors could upload learning documents, discussion boards, mail systems and live chat. In 2006, Blackboard Corporation completed the acquisition of WebCT and changed the LMS name to the Blackboard emblem (Itmazi & Megias, 2004). Blackboard Learning Management System was used by Otago Polytechnic and other educational institutions in the past few years. Nevertheless, the problem with Blackboard was the annual expensive licensing fee and its limitation to customize the E-platform (Oludele et al., 2014) that leads to finding free substitute LMS systems.

Shortly, Modular Object-Oriented Dynamic Learning Environment (Moodle) LMS was tried as a substitute of Blackboard throughout 2004 by B. InfoTech (Turnbull, Chugh, & Luck, 2019). Students who were in third year majoring in networking as well as lecturers had the opportunity to give Moodle a try by comparing it with their experience with Blackboard. Moodle is an Open-Source, learning management system to manage online courses. The LMS is widely used with over 43 million registered users (Oludele et al., 2014). Features of the platform include online quiz, instant grading, files management, assignment, and homework management (Oludele et al., 2014). Moreover, Moodle catered students with exterior availability to several material resources such as handouts, documents, or videos to learners, links for a platform as self-paced debates for several subject matters (Bremer & Bryant, 2014). The boundary to Moodle appeared rationally straight. As such, Moodle is less time consuming and easier for the eLearning personnel to use (Cavus & Zabadi, 2014). Even though Moodle has a lot of features and benefits, the LMS is not completely developed to handle high size educational institutions. As such, Moodle users face latency to access learning materials, attempt quizzes or to customize the E-platform (Suppasetseree & Dennis, 2010)

Additionally, Claroline is another Open Source, collaborative LMS developed by the University of Louvain (Belgium) in 2014 (Ülker & Yılmaz, 2016). Collaboration learning is concerned with how students can learn together using technology (Long et al., 2013). Claroline LMS allows instructors or schooling organizations to create and administer courses online. The system supports cluster administration, file and learning resource repository, project and assignment fields, and forum on a single bundle. Claroline is translated into 35 languages and used by hundreds of institutions

around the world (Remeˇs, 2005). Shortly, Claroline LMS was globally subsidized toward its progress and upgraded with additional features (Turnbull, Chugh, & Luck, 2019).

Likewise, Fle3 Learning Environment is another web based, collaborative LMS designed to assist learner and group centered work that focus on creating online programs. The LMS permits the storage of various learning objects including files, documents, and links related to studies, organize them into folders and enable sharing among teachers and students (Remeˇs, 2005). These are grouped as different versions which are automatically tracked and displayed graphically onto the E-platform. Fle3 LMS is more adapted as a collaboration tool for online group work and research.

With the evolution of technology, LMS are now moving to cloud solutions. Adobe Captivate Prime is among the most preferred Cloud based LMS which provides features to easily setup the LMS and track the learning progress of students in a friendly approach. It makes use of Fluidic Player and Intuitive dashboard supporting most formats for content and file exchange. The course structure is customizable and hence the learning path with choice of courses can be independently defined by the instructors. Feedback survey is also a feature for students in the LMS (Anand & Eswaran, 2018). However, the subscription fee for Adobe Captivate Prime is high and not affordable for many educational establishments.

Proposed Model

Based upon the background study, most LMSs have core functions to manage and design learning programs and allow for the exchange of learning resources. As such, the proposed Learning management system: MauriLearn is incorporated with the core functions of the several LMS discussed and is optimized for use for Mauritius secondary schooling system. This chapter covers the principles and methods employed while designing the Learning management system; MauriLearn. The entire development lifecycle follows proper coding standards and practices including Agile methodology, programming conventions and indentations to augment the readability, ease of unit and system testing and leverage rapid development cycles (Yu & Petter, 2014). The functional requirements, different user-roles, and algorithm-design are also illustrated.

Requirement Modeling

The system specification defines the functional requirements (FR) required for the proper operation of the Learning management system: MauriLearn. The different FR based on the three user roles: school administrator, teacher, and student are listed below:

1. The system (MauriLearn) shall allow administrators to login using valid credentials, to view profile page, to customize the platform as per school name and logo, to manage students (create, edit and delete) according to grade, to manage teachers (create, edit and delete), to perform bulk operations and to monitor all transactions onto the system.

2. The system (MauriLearn) shall allow teachers to login using valid credentials, to view profile page, to manage (create, edit and delete) subject-contents based on student's grade, to manage (upload, edit and delete) learning materials in form of PDFs, video presentations, word documents and links, to manage (upload and download) student's assessment and homework, to manage (create, edit and delete) internal quiz and to approve students' digital certificate.
3. The system (MauriLearn) shall allow students to login using valid credentials, to view profile page with statistics (completed and pending courses), to view learning path based on grade, to enroll for subjects, to be able to access and download learning materials (PDF, Video presentation, word document, external links), to attempt internal quizzes, to manage (download and upload) assessments and homework's onto the system and to manage (request and download) digital certificates upon subject's completion.

Functional modeling

Users will gain access on MauriLearn platform using valid credentials that are provided by the school administrator. The administrator has full privilege to monitor all transactions unlike teacher or student. Figure 1 shows the use case diagram of the Learning management system indicating the different user roles and their respective activities.
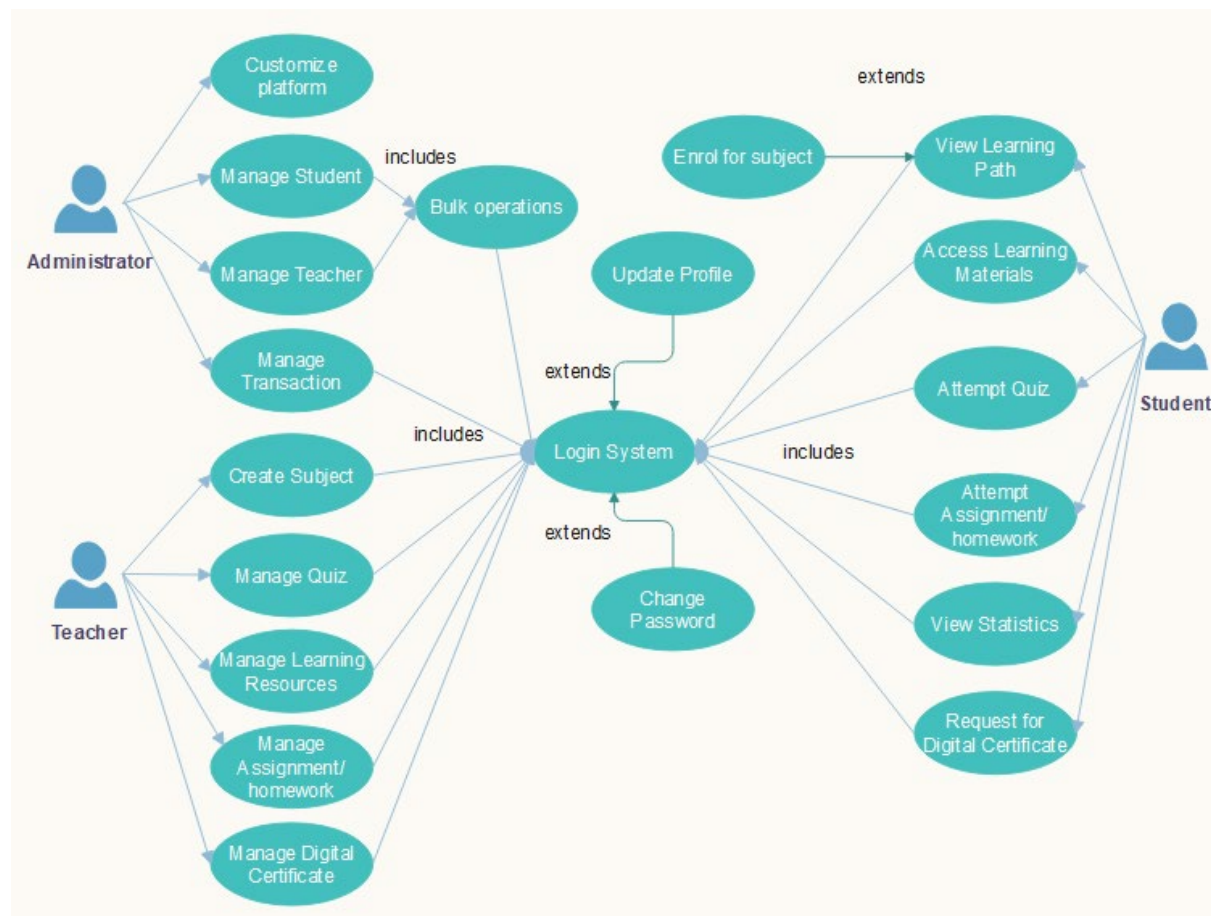
Figure 1: Use case diagram

System modeling

The class diagram as indicated in Figure 2 illustrates the design algorithm of the Learning management system, including the different model- objects and the relationships among them.
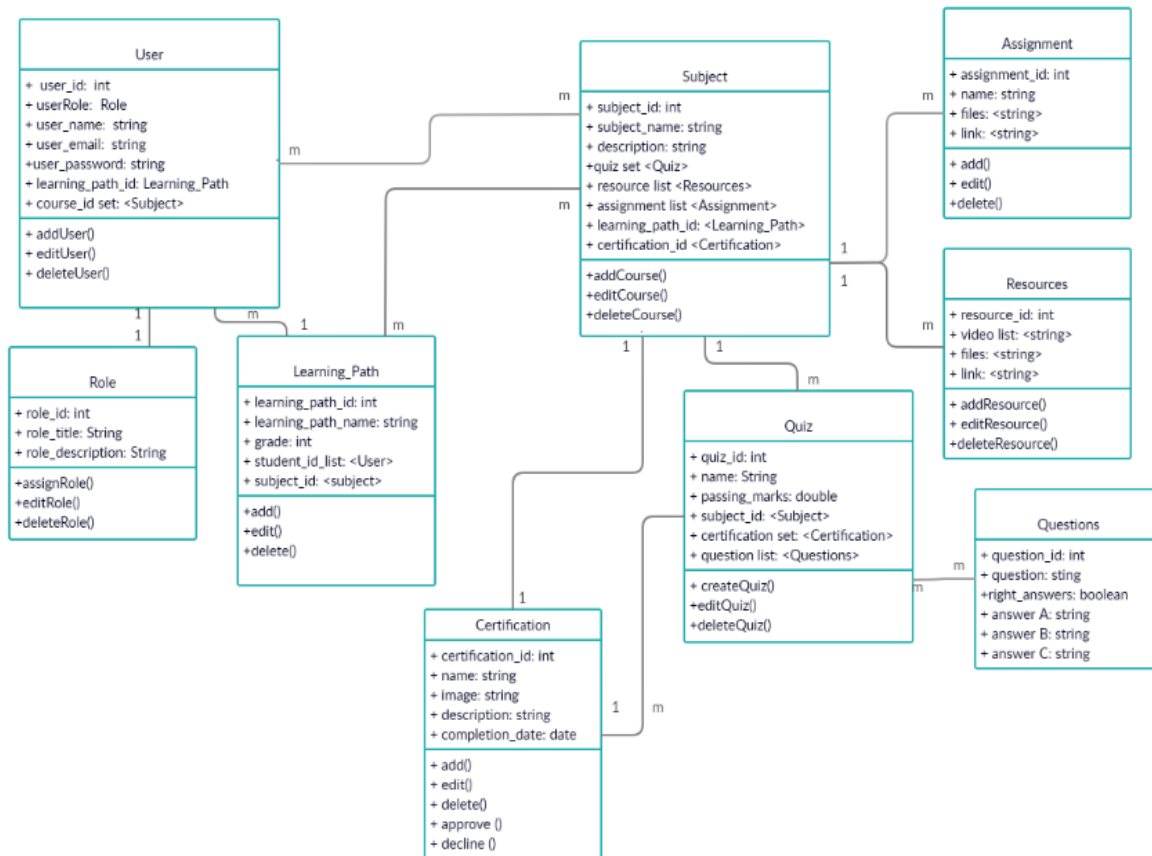
Figure 2: Class diagram

Development Tool and Environment

The E-platform: MauriLearn is implemented using Python over other programming languages for its numerous advantages including object-oriented and modular characteristics, it supports extensive libraries and integration features as well as it is cross-platform (Reddy & S M, 2018).

Table 1 shows the framework and various dependencies used to implement the E-platform.

Table 1: Development framework and dependencies

Language	Python
Database	MySQL

Web Framework	Flask
Dependencies	
reportlab	Library to generate PDFs and graphics
flask_sqlalchemy	SQLAlchemy is an Object Relational Mapper used to execute database operations using Python
flask_migrate	To handle SQLAlchemy database migrations
flask_uploads	Used to manage and handle file uploading
pymysql	Python-MySQL connector
flask_login	To handle user session management
flask-WTF	For HTML form and validation
pandas	Used to allow bulk upload

Connection of Modules

The Model -View- Controller (MVC) structural design is used to implement the E-platform. The model includes the logical data, functionality and logics of the different objects. Table 2 illustrates the different models in MauriLearn LMS.

Table 2: Description of Models

admin	For Admin management and logic
teacher	For teacher management and logic
student	For student management and logic
school	To manage school's name and logo
auth	Logic, logout and manage access
profile	Profile info, Statistics and change password
subject	Subject management including homework and assignment evaluation
resource	Resource management including upload and download functions
quiz	For quiz and answer modelling
learning_path	To manage students learning path based on grade system

Flask framework is utilized as the view for the E-platform. The view acts as the front-end of the system whereas the controller monitors the flow of data from the different models to the view and vice versa. Figure 3 indicates the connection among the different components.
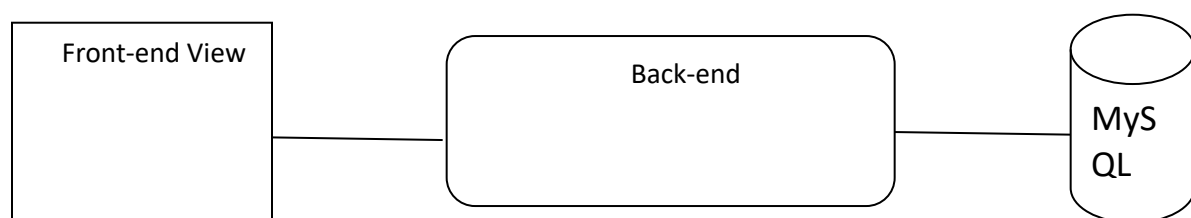
Figure 3: Connection of MVC components

Experimental Results and Discussion

The Learning management system developed was initially introduced as a prototype version. A closed-Beta test was performed with 30 students and 20 teachers from various secondary schools in the country. Interview results from the latter denotes that MauriLearn provides real-time access to subject resources, learning path, and internal assessment to students/teachers. The simple layout design allows users to effortlessly navigate the E-platform and carry out learning tasks with minimal hindrances. In addition, the quiz module of the LMS provides an easy way to perform internal assessment on a singular platform as per the concerns faced by the teachers with collaboration tools. Furthermore, students adhere to the "Made in moris" concept and feel a sense of belonging while using the LMS. This promotes motivation and acceptance to use the LMS for their pedagogical activities. MauriLearn is soon to be launched in a few secondary schools in the country as a pilot project for in-depth analysis and testing.

Conclusion

The COVID-19 virus was declared Pandemic by the World Health Organization ("The WHO Just Declared Coronavirus COVID-19 a Pandemic", 2020) on the 11th March 2020. This crisis has forced a shift from traditional classroom to virtual teaching. In Mauritius, all the educational institutions remained close for strict sanitary control. Academics and students have been required to adjust and adapt to various collaboration tools for online classes. However, being more business-meeting oriented, these IT tools lack some key characteristics present in LMS to properly withstand the learning and development of students. The purpose of this research project was to develop and implement a Mauritian, web-based, free- Learning management system; MauriLearn: https://www.maurilearn.com/ tailor-made for secondary schools. The LMS cooperates with important specifications and features to support the learning activities of secondary students. Additionally, the LMS can also act as a hybrid system in a blended learning mode (face-to face classroom sessions and online classes) for post COVID-19 period or during any other epidemics. Supplementary features such as teleconferencing, bulk email transactions and live-chat systems are yet to be implemented in the LMS. Those functions will be incremented in the current version of MauriLearn. Likewise, Artificial Intelligence frameworks can be integrated to convert the LMS into an Intelligent tutoring system (ITS)

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Critical reflection on teaching and assessment practices in a higher education setting in Mauritius during the COVID-19 pandemic national lockdown

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Abstract

The COVID-19 national lockdown was announced five weeks before the University of Mauritius examinations. Academics were faced with the unprecedented challenge to deliver teaching and learning in a context of adversity while fulfilling the promise of inclusive, quality education. This paper is a humble effort to share practices on the use of digital technology to ensure teaching and assessment continuity while working from home. Lecturer's resources, including audio and video recordings, were communicated to students via a learning management system. Students' requests for online teaching pushed the lecturer out of the comfort zone to experiment with video conferencing applications and discover a new way to facilitate learning. The University of Mauritius e-learning facilities and 2019 Google Classroom/Meet training contributed to academic digital agility in responding to the urgent need to engage students in remote teaching. During the confinement, the University took the decision to replace non-final year examinations by continuous assessment. Guidelines on the course evaluation framework were applied to develop summative assessment assignments. This created the opportunity to design questions aimed at evaluating higher order thinking skills. During the pandemic lockdown, quality time was available to craft challenging assignments. The assessment methods required students to work in teams within a defined time-frame.   The assignments were marked and online interviews were conducted to solicit students' feedback and assess individual contributions.   Reflections on pandemic response will inform future practice and research. Learning from this experience will enhance the level of pandemic preparedness and promote higher education resilience.

Keywords*:* Digital Technology, COVID-19, Higher Education, Teaching, Assessment, Learning, Online Pedagogy

Introduction

According to the United Nations (2020), "the COVID-19 pandemic has created the largest disruption of education systems in history, affecting nearly 1.6 billion learners in more than 190 countries and all continents''. Schrock (2020) proposed the "Years of Potential Intellectual Life Lost" (YPILL) as a measure of the impact of COVID-19 on intellectual advancement of a population which would be based on a mathematical estimate of citizens' intellectual contribution to society, students' learning, academic research and publication. Globally, educators are faced with the

unprecedented challenge of fulfilling the promise of inclusive, quality education to prevent a learning crisis from becoming a generational catastrophe.

It is recognised that resilient education systems play an important role in students' academic success in contexts of adversity by providing supportive environments which nurture effective learning experiences with socioemotional well-being (World Bank Group, 2016). Access to information and communications technology is vital to close the digital divide and promote higher education resilience within a pandemic scenario. Digital literacy contributes to the ability to embrace technology for emergency remote teaching and learning. Conley et al (2018) present a comprehensive review of the definition of "digital literacy" which has evolved from emphasis on technical skills to a more expanded concept which englobes a diversity and hierarchy of intertwined cognitive, motor, sociological and emotional skills. Digital competence is required to make confident, sensible, critical and effective use of technology in digital environments. Falloon (2020) commented that "digital competency" is broader than skills-focused "digital literacy". Janssen et al (2013) investigated experts' views to establish the knowledge, skills and attitudes that define digital competence. The authors constructed experts' collective view around 12 digital competence areas which address various proficiency levels, primary competences involving direct use of technology in surrounding and personal environments, as well as supportive competences namely: legal and ethical aspects; privacy and security; understanding the role of ICT in society; a balanced attitude towards technology.

During COVID-19 crisis, online learning was generally implemented in higher education institutions world-wide but some universities had to postpone delivery of courses indefinitely due to lack of information technology infrastructure (United Nations, 2020). Hodges et al (2020), proposed the term "emergency remote teaching" for the type of instruction involved when digital technology is used to ensure teaching continuity under pressing circumstances. UNICEF (2020) reported the distinction between "emergency remote teaching/learning" and "online learning". Remote teaching and learning is referred to as a sudden, often rushed, transition to distance education and/or virtual classrooms in response to a crisis. Digital technology is urgently deployed to deliver content designed for conventional methods of teaching. This use of educational technology relates to the "substitution" stage of the SAMR model (substitution, augmentation, modification, redefinition) conceptualised by Puentedura (2006), since it is a direct tool substitute for face-to-face teaching and does not necessarily lead to functional change.

Mishra and Koehler's (2006) TPACK (technological pedagogical content knowledge) framework presented a holistic approach that integrates technological, pedagogical and content knowledge to enhance students' learning. According to Singh (2020a), pedagogy implemented in face-to-face classes is not effective in virtual classrooms. Downes (2011) commented that "if you're using the same pedagogy with a stick and sand as you are using with a high-speed computer network, you really don't understand teaching and learning". Transformation of the educational experience in digital environments requires appropriate experts and new digital pedagogy (Blewett, 2015). Thus, pedagogy is an important dimension of online learning design (Hodges et al, 2020) and sound pedagogy should be applied to online teaching (Nakweya, 2020). The choice

of online learning tools for digital teaching depends on their pedagogical characteristics with reference to established and emerging theories of learning: objectivism and behaviourism; cognitivism; constructivism; connectivism (Bates, 2019). Online instructional formats need to be bolstered with inclusive and distinctive pedagogy which addresses learning outcomes, students' learning styles and the educational context. Effective online teaching and learning results from careful instructional design and planning (Hodges et al, 2020), as well as elaborate course materials and technology support teams (Wei Bao, 2020), which might not be optimal during emergency shifts to remote teaching.

The COVID-19 higher educational experience has enriched the global intellectual discourse and stimulated research among academics world-wide (Affouneh et al, 2020; Basilaia et al, 2020; Dhawan, 2020; Favale et al, 2020; Huang et al, 2020; Liguori and Winkler, 2020; Martin, 2020; Saxena, 2020; Wei Bao, 2020). However, there is no published work on pandemic response and forced transition to remote teaching in the higher education sector in Mauritius. This paper aims at sharing practices on the use of technology to ensure teaching and assessment continuity at the University of Mauritius during COVID-19 lockdown. It also attempts to answer the following research question: has the deployment of digital tools in a sanitary crisis situation embedded pedagogical paradigms and achieved functional improvement in teaching methods?

Research Approach

The approach implemented in this study draws from experiential methods used in participatory and qualitative research (Bilous et al, 2018; Moon, 2004; Morley, 2008). I situated myself as the research participant. I adopted the reflective practice technique to make meaning of my teaching and assessment practices during the COVID-19 pandemic. I chose the first-person narrative style in the writing of this educational journey. Records of instructional design and planning, course materials, teaching and assessment activities, as well as reflective thinking were documented and maintained in the following media: a paper diary; handwritten notes; audio and video recordings; Google Classroom Learning Management System; Google Drive; Google Meet and Zoom lecture recordings. These resources constitute objective evidence for the reflective work presented in this paper.

I am a lecturer in food science and technology at the University of Mauritius. I learnt the digital language later in life which means that I am part of the generation of "digital immigrants" (Prensky, 2001). During my career, I have acquired digital literacy through workshops organised by the Agence Universitaire de la Francophonie, the University of Mauritius and the Higher Education Commission. The University of Mauritius is the oldest publicly-funded higher education institution in the island (Higher Education Commission, 2020). Most courses were offered on face-face mode of teaching, until the COVID-19 pandemic hit. The University's Centre for Innovative and Lifelong Learning (CILL) is mandated to provide and develop the lifelong learning concept, on-line education and e-learning (University of Mauritius, 2020). Since 2015, I have been using Moodle e-learning platform, mainly as a repository of learning resources and activities. In August 2019, the University of Mauritius moved from Moodle to Google Suite. Training on Google Classroom was offered to academic staff to facilitate adoption of digital tools to manage teaching and learning.

The time-frame for the reflective study was March 2020 to August 2020. Teaching and assessment practices are reported for the transition of on-campus to online course delivery to 114 undergraduate students during COVID-19 confinement. They belong to the generation of "digital natives" who were born in the digital age. Prensky (2001) identifies "digital natives" as native speakers of digital jargon who are immersed in digital media.

Critical Reflection on Teaching and Assessment Practices

In Mauritius, the COVID-19 national sanitary lockdown was implemented from 20 March 2020 to 30 May 2020. On 19 March 2020, I collected hard copies of students' assignments and quizzes from my office at the University of Mauritius to be able to mark them at home, in anticipation of the COVID-19 confinement. This happened at a critical moment of the semester and was the beginning of a learning adventure. We were reaching the last five weeks of the academic year before final examinations, and were confronted with the task of delivering courses amidst a pandemic curfew. My teaching experience gave me the confidence that learning could continue during COVID-19 lockdown. Access to high-speed internet connectivity at home contributed to peace of mind. However, I did not know whether all students would be able to connect with me from their home settings. I did not want to leave anyone behind. I remained positive and believed that creativity, commitment and competencies were not locked down. The only way to remain engaged with students while being physically distanced was to make enhanced use of digital technology.

Digitally-enabled Teaching during COVID-19

When the COVID-19 lockdown was announced, my course materials and assignments were structured as classes on Google Classroom which enabled teaching continuity. The immediate response was to interact with students via Google Classroom stream to communicate emergency teaching arrangements. I was not comfortable with video conferencing applications which I had never used for lecturing. I had to react swiftly and think of a teaching method to provide explanations of lecture slides, course notes and laboratory practicals in order to facilitate understanding of new content. The voice recorder tool of my mobile phone came to the rescue. I thought of it because I had used this feature for family audio recordings in the past. I uploaded recordings of instructional messages to support course material being posted during the beginning of the confinement. To produce the audio recordings, I visualised myself talking to students in a face-to-face setting while referring to the course content on my laptop. There was no time for rehearsal. I spoke naturally and was mindful of the socioemotional well-being of students in a pandemic context. I also retrieved video recordings of laboratory practicals which I mounted two years ago to replace sessions which were missed due to torrential rain alerts in Mauritius. I had used my mobile phone's camera to make videos of the technician performing the practical procedure as I was simultaneously explaining each step. A summary of the audio recordings developed for one module is presented in Table 1. From 20 March 2020 to 31 March 2020, I was happy to record 25 instructional messages for 6 modules. The idea was to maintain a human connection with students. The recordings' length spanned from 2 to 20 minutes. Content focused on encouraging students to use module resources, guiding them to manage time constructively and making them feel that they were cared for. It was also important to get into

a working routine, develop self-discipline and ensure wellness to adapt to the overwhelming learning scenario.

According to Bates (2019), recorded audio can be a powerful educational medium with unique pedagogical characteristics, namely: development of students' auditory skills; enhanced student attitude by presenting material in a novel perspective; augmented flexibility and learner control. However, audio resources contribute to boost students' learning if they are listened to. Thus, further to posting of the recordings, students were convened to a synchronous Q&A interaction via Google Classroom stream to address queries on the instructional voice messages and ongoing learning activities. This provided evidence that some students had referred to the recordings which stimulated their thinking.

Table 1. Audio recordings of instructional messages produced during COVID-19 lockdown for one module.

Course title	Module title	Module topic	Purpose of recording(s)	Date of posting of recording(s) on Google Classroom	Number of audio recordings	Length of each recording (minutes: seconds)
BSc (Hons) Food Science & Technology (with 6-month Internship) (Year 1)	Food Chemistry and Food Analysis I [a]	Chemistry of sugars in foods	To explain the scientific reasoning behind the practical steps implemented to determine the concentration of sucrose To provide guidance on how to use the lecturer's laboratory practical video recording and other relevant course material to work through calculations required for the laboratory portfolio to be submitted online via Google Classroom as a continuous assessment assignment	20 March 2020	1	6:28
		Chemistry of lipids in foods	To complete teaching of the topic which started before the lockdown, by providing supplementary explanations of specific lecture slides	24 March 2020	4	7:04-8:12
				25 March 2020	3	16:12-16:34
		Analysis of caffeine in soft drinks	To explain the scientific rationale underlying the steps with reference to the practical handout and a You Tube video resource uploaded on Google Classroom To provide guidance on how to use the course material to carry out the practical portfolio activities to be submitted online via Google Classroom, as a continuous assessment assignment	31 March 2020	1	18:28

[a]: This module was offered within the new Learner Centered Credit System (LCCS) which was introduced in the current academic year at the University of Mauritius. In the LCCS, teaching contact hours as well as student learning hours contribute to module credits.

During the last week of March 2020, other lecturers were delivering courses via the Zoom application and students' requests for online teaching pushed me out of the comfort zone to experiment with video conferencing.   I retrieved the Zoom web-link which the University had communicated as a COVID-19 contingency measure by email on 16 March 2020.   I was able to download the Zoom application, sign up and launch a meeting. I felt ready to perform my first online lecture after carrying out the audio equipment test, trying the various user-friendly functionalities, recording and viewing a short rehearsal. During the first week of April 2020, I used Zoom since there was no time limit on meetings. However, as from the second week of April 2020, the 40 minutes limit was reinstated. I therefore shifted to Google Meet which had no time restrictions. To get started I referred to the quick reference guide which was emailed by the University of Mauritius. I delivered 6 online lectures from 3 April 2020 to 23 April 2020. Attendance rate varied from 60 % to 100 %. I was able to record 4 out of 6 lectures using the corresponding functionality in Zoom and G Meet applications. I will review the video recordings to improve my online teaching skills. They might also come handy in future emergency situations.

The duration of the online lecture sessions was lengthy (1.5-3 hours). This is recognised as a risk factor impacting on the quality of teaching (Eze and Edward, 2017). However, the lectures had to be extended to complete teaching of core content within a reduced time frame resulting from COVID-19 adjustment period. This was cognitively demanding for me as well as the learners. But students cooperated and did not complain. Wei Bao (2020) outlined instructional strategies for online teaching based on a case study conducted at Peking University during COVID-19 outbreak. The author recommended to structure content delivery into small modules of 20-25 minutes and highlights the importance of focusing on pace of speech to capture students' attention.   Other authors have provided practical solutions for virtual teaching challenges to enhance digital competence (European Commission, EACEA, Eurydice, 2020; Martin, 2020; Saxena, 2020).

Internet connectivity was adequate when all students had the microphone and camera turned off during the lectures. Some students used their smartphone instead of their laptop due to sound/video issues. Students helped each other via phone calls or messaging to learn how to join the virtual classroom and resolve sound/video problems. It was encouraging to witness the solidarity among them to ensure that nobody was left out before I began the session. The lectures were delivered smoothly with most students requesting to be admitted on time. I felt more comfortable using digital technology with practice and could focus on course content and pedagogy. However, it was not possible to gauge students' attention, write on a whiteboard to facilitate learning and adjust teaching style according to nonverbal cues, as I would in a standard classroom setting.   After the lecture, the participants were unmuted for Q&A via the chat functionality. The number of students' queries/responses ranged from nil to 13.   In many cases, this interactive session contributed to further explain course material and clarify instructions for learning activities. The human connection was being weaved through "remote" teaching and learning.

Dhawan (2020) conducted a SWOC (Strengths Weaknesses Opportunities and Challenges) analysis of online learning in crisis situations linked to coronavirus pandemic and other natural disasters. One proposed solution to prevent students' disengagement is to effectively use digital tools to create dynamic and interactive learning experiences.   User-friendly presentation

applications make possible integration of online quizzes within lectures to motivate active learners' participation (Singh, 2020b). Furthermore, real-time quiz data analysis and display of visual graphics may be used in formative assessment to monitor students' progress.

Innovative Course Assessment during COVID-19 lockdown

Final year students submitted their dissertation drafts through the Turnitin platform in April 2020. I used Turnitin Feedback Studio to insert comments which students could read on the platform. I was also able to check whether students had viewed the annotated drafts through the response column of the assignment inbox. I found the online grading tool convenient, efficient and user-friendly.

For most modules, students were required to work on continuous assessment assignments which had to be turned in via Google Classroom by the end of April 2020. I addressed students' queries on assignment instructions and related course material via asynchronous exchanges on Google Classroom stream and email. This was another opportunity to make use of digital tools to promote active students' learning. In the case of two modules on scientific communication, students were required to deliver presentations on a relevant topic. Google Meet was effectively used to conduct and evaluate student group presentations for two cohorts of 20-28 students. At the beginning of the session, all participants' cameras were turned on and the tiled layout feature was selected to see most students on the screen in order to simulate the standard classroom setting. Some students were familiar with sharing Powerpoint slides during a G Meet meeting. Others required assistance from me, the "digital immigrant". In a few cases, I downloaded the submitted slides and shared my screen while the students were presenting remotely.

Continuous assessment group assignments which were turned in during the pandemic lockdown, were graded and commented via Google Classroom. Students could view my comments in the returned assignments. I carried out online grading and inserted annotations for 6 modules amounting to 60 group assignments. The digital annotation tool was useful in formative assessment and helped me save valuable time. I made use of email and Google Classroom to communicate feedback on course assignments and quizzes which were submitted in hard copy before COVID-19 confinement.

Alternative Summative Assessment Practices

On 15 April 2020, the University took the decision to replace non-final year examinations by continuous assessment, named as "additional continuous assessment in lieu of examinations". I followed the guidelines on the related course evaluation framework to develop summative assessment assignments. The main issues related to crafting effective assignments, controlling plagiarism and ensuring that the submissions reflected students' work. My teaching and assessment experience was put to the test. It was important to create space and quality time to design challenging assignments. I remained calm and took the challenge as an opportunity to improve on assessment methodology. I was guided by the case-study approach which falls under the umbrella of Problem Based Learning (PBL) assessment strategies (Grimes, 2019) to develop meaningful learning beyond memorisation of course content.

I developed questions with reference to module learning outcomes defined in Module Specification Sheets/Module Catalogues communicated to students at the beginning of the academic year. I focused on addressing the following cognitive levels of Bloom's revised taxonomy: applying; analysing; evaluating (The Peak Performance Center, 2020).   I opted for group assignments to foster cooperative and collaborative learning (Sawyer and Obeid, 2017), as well as a sense of community in the context of COVID-19 adversity. Student team interviews were planned after assignment due dates in order to determine each student's contribution to group submissions. It was also a new way of assessing student's performance which I intended to explore.   My proposed assessment structure, method and schedule obtained Faculty's approval. Instructions, questions and resources for summative assessment assignments for 9 modules were posted on Google Classroom between 11 May and 03 June 2020.   A sample of assignment instructions and questions is shared in Figure 1, Figure 2, Figure 3 and Figure 4. Similar assessment format and approach were applied to all modules. Case-based group assignments integrated the authentic learning approach which has been put forward by Herrington and Oliver (2000) to enhance students' work readiness.

COVID-19 lockdown was lifted on 31 May 2020. By 10 June 2020, 71 additional continuous assessment assignments were turned in on Google Classroom. However, online grading with annotations could not be undertaken due to confidentiality of marks and comments. I printed the assignments to ensure effective annotated marking with respect to expected answers and marking schemes.   My eyes and shoulders were getting tired as a consequence of extended computer screen viewing while working from home during the confinement period. It was less straining to mark hard copies of summative assessment assignments. I designed Excel sheets to enter marks allocated per question for each student. I also checked Turnitin similarity reports for plagiarism. I made notes on learning gaps which I spotted in students' answers while I was marking the assignments. These were helpful pointers to prepare for the online interviews. Additional continuous assessment assignment marking took place from the first week of June 2020 to mid of July 2020.   This period also involved invigilation of face-to-face final year examinations implemented in compliance with COVID-19 institutional guidelines.

I developed a generic marking scheme and a pool of module specific questions for assessment of online Google Meet interviews. From 15 June to 10 July 2020, I conducted 61 team interviews as well as 9 individual interviews of students who were retaking a module which they had failed or missed in the previous academic year.   Out of 114 students, 2 did not attend the online interviews and did not provide valid justifications.   I posted Google Classroom stream notifications of interview schedules at least 2 days before the online assessments and communicated G Meet joining information to students on the day of the interviews. A few students did not feel comfortable to turn on their computer's camera during the sessions and made use of audio or chat functionalities. Interview duration ranged from 15 to 30 minutes and we did not encounter major issues with internet connectivity.   In Mauritius, the government's national policy on digitalisation and ICT infrastructure has contributed to expanding internet access (Ministry of Technology, Communication and Innovation, 2018).   However, in many countries students have been deprived of online teaching and learning during COVID-19 due to the digital divide (Dwolatzky and Harris, 2020; Jalli, 2020; Mandal, 2020).

Figure 1: Summative assessment assignment instructions and resources posted on G Classroom.

Assignment instructions specified before the questions

UNIVERSITY OF MAURITIUS
FACULTY OF AGRICULTURE
ADDITIONAL CONTINUOUS ASSESSMENT ASSIGNMENT
IN LIEU OF EXAMINATIONS

Programme: BSc (Hons) Food Science and Technology (Minor: Food Entrepreneurship) (with 6-month internship) (Year 2)

Module: Food Safety and Quality Management

Module Code: AGRI 20108Y(3)

Lecturer: Mrs B Aumjaud

Answer ALL questions in groups of 2 or 3 students

Submission by 25th May 2020: Turnitin & Google Classroom (The team leader uploads the group assignment and the Turnitin similarity report on G Classroom by the due date/time)

Assignment assessment structure specified after the questions

Presentation (text font type Times New Roman, font size 12, 1.5 line spacing, justified text alignment; tables; figures): **1.5 marks**

Grammar/style (English grammar, syntax and clarity of expression): **1.5 marks**

Referencing (in-text and list of references as per Harvard System of Referencing): **2 marks**

MAXIMUM TOTAL MARKS: 110

WEIGHTED MARKS: 60 (each student in the group obtains the same mark for the submitted assignment)

10-15 MINUTES INTERVIEW OF STUDENT GROUPS IN JUNE 2020, VIA GOOGLE MEET (*Date and time will be communicated by the lecturer by the beginning of June 2020*)

Purpose: to assess each student's contribution to the submitted group assignment

Maximum interview marks: **10** (individual mark awarded to each student based on performance in the interview on the submitted group assignment)

ADDITIONAL CA ASSIGNMENT WEIGHTED MODULE MARKS: 70 % (60+10)

Mrs B Aumjaud/ 18 May 2020

Page 5 of 5

Figure 2: Summative assessment specifications in the assignment question paper.

4. An extract of the HACCP plan developed by the HACCP team of a small food enterprise manufacturing breadfruit and fish frozen burgers for local and regional markets, is given below:

EXTRACT OF THE HACCP PLAN FOR ONE PROCESS STEP
PRODUCT: Breadfruit and Fish Frozen Burgers
Food safety hazards: Microbiological

Process Step	Significant hazard HACCP P1	Control Measure HACCP P1	CCP (yes/no) HACCP P2	Critical Limit (s) HACCP P3	Monitoring Procedure HACCP P4	Corrective action (CA) HACCP P5	Verification HACCP P6	Records HACCP P7
Storage of raw fish in the refrigerator	•Growth of *Vibrio parahaemolyticus* (primary sources: seawater; marine life)	- Store at Low Temp. - Control Storage Time	YES (CCP)	T: Max 4 °C	-Continuous monitoring of air temperature by Indicating thermometer -Temperature checked by store supervisor every thirty minutes	•Adjust temperature as per CAP (Corrective Action Procedure)	--Verification of air/ -product 7 by Food Safety Officer weekly -Verification of activities/records -once daily/weekly	-Monitoring records -CA records -Maintenance records -Calibration records
	•Cross-contamination with pathogens	Separate raw & Cooked Foods During storage	NO (CP)					
	•Contamination with pathogens	Sanitation of storage area	NO (CP)	Time: Max 3 dys	Store supervisor checks date of every batch of poultry daily	•Discard if more than 3 days as per CAP (Corrective Action Procedure)		

(a) Do you consider that HACCP team has correctly identified "growth of *Vibrio parahaemolyticus*" as a significant microbiological food safety hazard at the "storage of raw fish in the refrigerator" process step? Justify your answer with reference to the Codex method for application of HACCP principles. (**6 marks**)

(b) The HACCP team used the Codex CCP decision tree to decide whether the process step is a Critical Control Point (CCP) for the identified significant microbiological food safety hazards. Do you agree with the outcomes of the application of the CCP decision tree presented in the HACCP plan? (**4 marks**)

(c) Is the critical limit for temperature correct? How would you guide the HACCP team to scientifically validate the critical limit for air temperature of the refrigerator as required by Codex? (**4 marks**)

(d) The extract of the HACCP plan shows four levels of control of the significant microbiological food safety hazard at the CCP. Can you identify them and explain how they address different levels of control? (**8 marks**)

(e) The figure below shows critical limits validation data collected by another HACCP team of a food enterprise manufacturing a cured product. The figure is taken from the scientific paper entitled "How does industry validate elements of HACCP plans?" which is uploaded with the assignment questions on G Classroom.
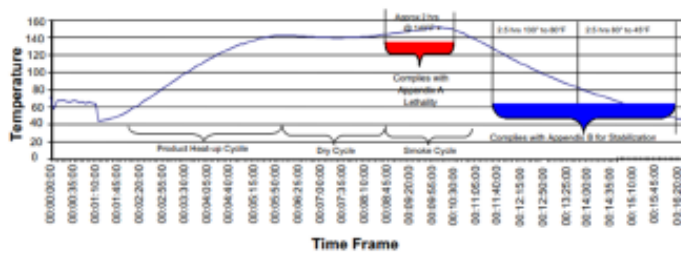
Fig. 2. Validation of smoking and cooling processes for a cured product.

Do you consider that the above data provides adequate validation proof for the smoking process time and temperature conditions of the cured product? (**3 marks**)

Figure 3: Example of summative assessment questions: question 4 from one assignment paper.
Note: Year 2 assignment question paper comprising 4 questions. Students were required to turn in their group submissions within one week of assignment posting.

Extract from year 1 assignment question paper comprising 7 questions

5. A Benedict test was carried out on the products of chemical reactions of sugars. The results obtained by a group of students are given in Table 3.

Table 3. Results of the Benedict test on the products of chemical reactions of sugars/starch.

Reactant(s)/enzyme (under optimal conditions of temperature, time and pH)	Outcome of Benedict test on Reaction Product(s)
Starch with amylase	Negative
Maltose with transglucosidase	Positive
Sucrose with glycosyltransferase	Positive
Glucose with glucose oxidase	Negative
Lactose with β-galactosidase	Positive
Glucose and Fructose with glucose/fructose oxidoreductase (GFOR)	Negative

(a) State whether you consider that the results presented in Table 3 are correct. (**3 marks**)

(b) Justify your answer for part (a) with appropriate scientific explanations relating to the chemical structure of the reaction product(s). (**6 marks**)

Extract from year 2 assignment question paper comprising 8 questions

8. Food formulators have to select appropriate ingredients to fulfil requirements and consumer expectations. You have been recruited as food innovation officer of the University Agri-Tech park, agri-business incubator, to advise food entrepreneurs in their choice of food ingredients to develop further their product ideas.

Case A: A start-up business has embarked on the development of a new coconut based sport drink product in order to meet the demand of athletes for beverages which provide a steady source of energy during long training sessions. Propose a permitted sweetener as sugar replacer for the new food product formulation, based on a valid scientific rationale with respect to safety, biological, functional and sensory considerations. (**4 marks**)
(*maximum 10 concise sentences presented as bullet points*)

Case B: Another food enterprise intends to explore the product idea of a plant-based cheese product for plant-based burger sandwiches targeting vegetarian consumers. You have retrieved a resource on a plant-based cheese formulation from an internet search. The document entitled "100% plant-based cheese for hamburgers" is uploaded with the assignment questions on G Classroom. The main structure of dairy cheese is determined by casein micelles which aggregate to form a three dimensional network. The proposed formulation substitutes milk with other ingredients to obtain a product which imitates the sensory characteristics of dairy cheese. Do you consider that this cheese analogue will taste and look like real cheese? Provide scientific explanations based on your understanding of the chemical basis of dairy cheese texture. (**4 marks**)
(*maximum 10 concise sentences presented as bullet points*)

Case C: A small bakery has solicited guidance on the product concept of a "gluten-free bread" to address the dietary needs of consumers who suffer from celiac disease. Scientific research on formulation and quality of gluten-free bread provides insights on the prospects of substituting wheat flour by legume flours. With reference to the scientific paper entitled "Effect of legume flours on baking characteristics of gluten-free bread", describe and explain the findings of the authors on baking characteristics and texture parameters of legume flour gluten-free breads, presented in Table 2 and Figure 2 of this publication. The scientific paper is uploaded with the assignment questions on G Classroom. (**4 marks**)
(*maximum 10 concise sentences presented as bullet points*)

Figure 4: Example of summative assessment questions 5 & 8 from two assignment papers.

The purpose of online student interviews on submitted assignments was to solicit students' feedback and assess individual contributions in order to address issues of fairness and validity. Generally, students were well prepared and groomed for the online events. I started the interviews with questions on the assignment team experience. Students were enthusiastic to share their reflections on organisation of team work, the most challenging question(s), team dynamics and support. Most student teams expressed that their assignment learning experience was constructive. They also responded that the distribution of work among team members was equitable. However, they considered that effective time management was essential to meet close deadlines for a high number of assignments to be submitted to several lecturers. They demonstrated a positive attitude to team learning.

The second part of the interview focused on specific questions relating to their submissions. An example of a pool of interview questions for a specific module is presented in Figure 5. Each student was assessed according to the level of accuracy of the answers, the level of confidence in formulating the answers and the level of assistance required from me to help them deconstruct the questions to construct the answers. Some students felt intimidated by the technology-mediated assessment method. I gradually learnt to weave human connection with students via the computer screen interface. I was able to engage in dynamic and compassionate interactions to create a relaxed atmosphere so that they could express themselves freely. I made notes on students' responses during the interviews and objectively rated the individual student's performance at the end of each team interview.

Students' answers during the digital interviews demonstrated their learning from the assignment and provided evidence of hard work in most cases. This contributed to the validity of the method which is based on the principle of assessing the assignment product as well as the process (Carnegie Mellon University, 2020). However, the effectiveness of this approach in ensuring fairness depends on the proportion of marks allocated to group assignment and individual interview performance (Centre for Academic Development, 2013). In the present case, the weighting for the group assignment product ranged from 75 to 87 %. However, a low weighting was allocated for the oral interview since I was uncertain about feasibility of this novel assessment strategy in terms of aptitude, students' mindset and buy-in. In the light of positive student participation in the online interviews, I will introduce this technique during formative assessment activities in the future. I will also explore other weightings/methods of assessing group assignment to obtain valid information on team work process and individual contributions for enhanced fairness in grading (Centre for Academic Development (2013); Carnegie Mellon University (2020); Hassanien (2006); University of Waterloo (2020)).

HYDROGENATION/MARGARINE/FAT SPREADS
- What are trans fatty acids (TFAs)?
- What hydrogenation mechanisms contribute to the formation of TFAs?
- Why does high hydrogenation temperature contribute to observed increase in TFAs?
- How does catalyst pore size affect proportion of TFAs?
- What are Conjugated Linoleic Acids?
- What type of emulsion is margarine and why?

SWEETENERS
- What factors will you consider when selecting an appropriate sweetener to replace sugar in the formulation of a diabetic jam product?
- What factors will you consider when selecting an appropriate sweetener to replace sugar in the formulation of a drink for athletes?

LANE AND EYNON TITRATION
- What sugars are present in an aqueous solution of jam in the burette before starting the Lane and Eynon titration?
- What does incomplete discharge of colour of Fehling's solution after adding 50 ml of jam solution mean?
- What is the solution to this problem encountered by a group of students during the laboratory practical session?

CASEIN MICELLES/GLUTEN NETWORK
- What chemical structures contribute to the texture properties of cheese?
- What is the chemical and functional challenge of replacing milk by plant proteins in plant-based cheese?
- What chemical structures contribute to the structure of the wheat flour dough and the light texture of wheat bread?
- What is the chemical and functional challenge of replacing wheat flour by legume flour in the formulation of gluten-free bread?

Figure 5: Pool of questions for online student interviews on food chemistry and analysis topics (undergraduate, year 2 module).

Online interviews with teams of 2-3 students in home settings were implemented as a component of module summative assessment. Interestingly, the interviews also served a pedagogical function. Discussions with small student groups created the opportunity to address identified learning gaps and deepen understanding of key course topics. Small group online or face-to-face teaching sessions with students are identified as seminars or tutorials (Bates, 2019). These examples of dialogue learning have been used to develop critical thinking skills through the application of constructivist and connectivist pedagogy. Gardner (2020) elaborated on the value of student interviews as a laudable tool for mentoring and assessment. Greenlaw and Deloach (2003) explained how they used web-based threaded discussion to teach critical thinking. Undergraduate economics students were required to participate in electronic discussions by posting substantiated and logically framed arguments on specific discussion topics. The quality of argumentation was measured according to a taxonomy of critical thinking relating to different levels of intellectual activity. The authors argued that the instructor's role was to keep the discussion focused and to guide students towards discovering insights rather

than formulate insights for them.   Furthermore, selection and wording of discussion topics as well as student engagement, access to background resources and prior instruction on constructing arguments contribute to the effectiveness of electronic discussion in developing critical thinking skills.

At the University of Mauritius, continuous assessment in lieu of examinations was completed in August 2020. All non-final year module marks were moderated, processed and approved as per Faculty's quality assurance procedures.   Digital technology, digital literacy and innovative approaches were vital to ensure continuity of teaching and assessment during COVID-19.

Conclusion and Recommendations

Enhanced use of digital technology during the COVID-19 outbreak brought me closer to students to understand them and sustain learner engagement. From the reflection on emergency remote teaching practices, it can be concluded that application of pedagogical principles relating to critical thinking, collaborative and authentic learning, have contributed to enrich instructional methods within online learning scenarios in a crisis situation.   The transformative educational experience has provided insights and perspectives which will inform my transition to blended teaching. Interactive digital tools will be integrated in lectures to boost learners' engagement. Case-based group activities will be designed to embed authentic and critical pedagogy during face-to-face interactions to support lecture delivery via video conferencing.   Online interviews of student teams have emerged as a group assignment assessment method which needs to be explored further.   Seminars and tutorials will be used in teaching and formative assessment to create opportunities for dialogue learning within online environments.

As the world recovers from the pandemic, educators are learning the digital language and adapting their teaching and assessment methods to virtual classrooms. Inclusive online teaching with effective pedagogy will contribute to deliver quality education and enhance higher education resilience.

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Student Experiences Of An Emergency Online Learning During The Pandemic Lockdown

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Abstract

Online learning has recently expanded dramatically in institutions of higher learning. Due to the rapid spread of the COVID-19 pandemic, institutions of higher learning have opted to offer emergency online courses. Although access to digital technology is beneficial for students, challenges and problems will always accompany transformation. In recent years, researchers have become increasingly interested in students' perceptions regarding online education. However, little is known about students' experiences of an emergency online learning during the pandemic lockdown since this is a new occurrence that caught the institutions unprepared. As a result, technological infrastructural challenges remain an issue facing higher education in South Africa especially in rural-based institutions of higher learning. The literature shows that inequalities in access to technology devices have negative consequences for some students. Studies also indicate that students from poor families reflect a tendency to struggle academically when competing with better-resourced students. A pilot study was conducted and a qualitative research approach was used to examine students' experiences regarding online learning. Semi-structured interviews were utilised to interview fifteen undergraduate students. The researcher used thematic analysis to interpret the data collected. The results revealed that online learning promotes socially-defined exclusivity in terms of accessing digital technology, even though it is a convenient alternative to learning. The study recommends that equipping students with online skills at the entry-level of their registration will boost their confidence and improve their performance.

Keywords: Online Learning, Institutions Of Higher Learning, COVID-19 Pandemic, Lockdown

Introduction

Institutions of higher education in South Africa have gradually been adopting a strategy of online learning delivery (Alsaaty, 2016). Even though the improvement of technologies has paved the way for online learning, the question that remained unanswered was how this change will eventually affect institutions across the nation. Although emergency online learning has turned out to be a substitute for crisis response in higher institutions to save the academic year 2020, it has deepened the inequalities for those students without access to connectivity in rural areas. Emergency online learning might deprive some students of a meaningful learning experience since content delivery is in English alone, and this could have a negative impact on their academic performance. Similar studies conducted by Robinson (2014) revealed that socio-economic differences in students' experiences with technology, and inequalities, have also been found among students both at home and in institutions of higher learning. Studies indicated that online

learning has turned out to be a significant approach in higher institutions due to its effectiveness in providing low-cost learning, easy accessibility in terms of time and place, as well as its ability to overcome numerous common teaching and learning challenges including shortage of lecture halls (George et al. 2014; Allen & Seaman; 2011). Although a substantial number of studies have been piloted to observe digital learning communities (Tallent-Runnels, Thomas, Lan, & Cooper, 2006), little is known on students' experiences of emergency online learning activities being offered during the pandemic lockdown. This study has identified a research gap since remote emergency learning is still a new field. To discover the challenges and problems relating to online learning, the author decided to explore the learners' opinions concerning the value of online learning during this period. Therefore, the objective of this research is to examine students' experiences, perceived challenges, and opportunities associated with online learning activities during the COVID-19 pandemic lockdown.

Literature Review

While remote emergency teaching may be new, the field of distance and online learning was already in use. However, due to the implementation of emergency remote learning, it has become apparent that it was inadequate and required more technological resources. Therefore, as a response to the pandemic crisis, remote learning had to be introduced. Remote learning came with a lot of challenges especially for those institutions that are under-resourced in terms of technological infrastructure, and where some of the lecturers and students lacked digital skills and equipment. Studies have demonstrated that learners from poor backgrounds tend to struggle academically when competing with better-resourced students (Greenhow & Burton, 2011; van Deursenand & van Dijk 2019). Students from historically disadvantaged or rural-based institutions of higher learning still experience insufficient resources such as lack of reliable devices, poor connectivity, inadequate internet infrastructure, high cost of data, and unreliable electricity at home, which are all prerequisites for online learning. According to the study conducted by Eyles, Gibbons, & Montebruno (2020), students from underprivileged backgrounds are more vulnerable due to the unavailability of resources compared to other students who come from well-resourced families.

Zandberg et al. (2008) stated that since the country started moving towards being a technology-dependent society, the field of higher education has started to shift from location-specific instruction and traditional classroom-based education to virtual learning settings. As a result, digital learning has increasingly developed as an essential part of higher learning institutions' programmes. Blackmon & Major (2012) argued that information regarding student experiences can also benefit institutions on faculty design, and enable them to offer enhanced programmes to advance student learning. It could also enable institutions to decide what challenges students are facing regarding online learning. This could in turn increase students' determination in using online programmes (Blackmon & Major, 2012; Hughes et al., 2018). Therefore, the study's main question is: how do students define their online learning experiences?

Several studies highlighted that online learning has also facilitated new ways for learners to take part in their learning and to reflect on it (Picciano, 2017; Hughes et al., 2018). Using and creating

interactive program content can offer opportunities for students to collaborate with other learners in a more constructive way inside and outside of the classroom (Bonk, 2009; Hanifah *et al.,* 2019). Currently, students are in search of first-hand, original forms of course delivery due to the development of technology. Students live in a technologically independent community, with surrounding media interactions and curriculum delivered via digital broadcasting (Roberts & Koliska, 2014). Higher Education in South Africa is also refining its teaching and learning objectives to accelerate inclusive educational changes to cater for the challenges of future generations. Such initiatives will bring about the demise of digital learning approaches *(*Linjawi, 2018*)*. However, challenges and problems will ever accompany transformation, including those of technological and social nature (George et al., 2014; Allen & Seaman, 2011). In higher institutions of learning, digital learning serves a diversity of purposes, such as teaching, throughput, and innovation (Roblyer & Hughes, 2019). Bulfin et al. (2016), on the other hand, encourages further inquiry into what "the realities of online learning" encompass, this includes uneven connectivity, cost of data, and technological equipment.

Ponzurick et. al. (2000) established that students choose the traditional learning environment of delivery above the online learning method. Further research has recognised that learners acknowledge the opportunities that come with digital learning, namely, eliminating the need to attend a lecture, the convenience to operate at their pace, greater accessibility to programmes, and being better able to network (Simonson, 2005]. Furthermore, Reynolds, (1995) established that in online programmes, learners were generally compelled to devote more effort to satisfy their educational requirements. Conrad, and Donaldson's (2004) inquiry stated that in online programmes, students developed a partnership with other students and demonstrated a high level of engagement in analytical and critical thinking. Numerous devices and approaches associated with digital learning have been discovered in various studies as operational mechanisms conducive to teaching environment (Allen & Seaman; 2011; Hanifah *et al.,* 2019).

However, some scholars are concerned that value and the education experience could well be compromised in online learning as opposed to classroom engagement (Robinson, and Hullinger, 2008, Howland & Moore, Vonderwell, 2003). Some authors have mentioned numerous hindrances in online curriculum, including the absence of active engagement between student and lecturer and between student and student matters of confidentiality, internet complications, and an emphasis on online education as opposed to curriculum (Plotrowski, and Vodanovich, 2000; Rovai, 2002). Blackmon & Major (2012) argued that it is essential to begin to discover students' experiences with online learning since doing so can foster student approval in the online setting, effective online practices, and student views of online learning.

The theoretical framework underpinning this study is socio-constructivist epistemology that (Hughes et al., 2018) perceives individual outlook, experience, and beliefs, as well as interactions with other people, tools, and language, as being integral to learning. As such, existing learning principles and methodologies are progressively becoming reflections of students' social environments (Secore, 2017). The usage of reflective practice by both student and lecturer is an educational foundation for collaborative debates that substitute traditional teaching, whether in a face-to-face or online class (Picciano, 2017. The author further elaborates that John Dewey

perceived learning as an outcome of a sequence of active social insights in which students learn by doing, collaborating, and reflecting with others. The application of the theory is evident when the lecturer arranges discussion forums for groups and awarding those who are participating in the forum, encouraging the use of WhatsApp, email, and instant messaging. Scholars have deemed online interaction to be more rewarding, more inclusive (Swan, 2017), more reflective (Garrison et al., 2003], and more personal (Walther, 1994) than traditional classroom discussions.

Methodology

A pilot study was conducted prior to the actual data collection period of this research. The researcher utilised the pilot study as it offers valuable information that can be used to execute the full research study. Several authors describe a pilot study as a small research conducted prior to a larger piece of study to determine whether the methodology, sampling, data collection, and analysis are sufficient and suitable (De Vos et al. 2014). The importance of conducting a pilot study offers the researcher a chance to make the required adjustments for the effective carrying out of the research project. The target population for the study is level two undergraduate students that meet the set criteria required for the research inquiry (Creswell, 2015). Since this is a working paper in progress, a sample size of 15 students out of 268 who constitute the actual class size, were purposefully selected from the Department of Development Studies at the University of Zululand in South Africa.

A qualitative research approach was used to examine the students' experiences regarding emergency online learning during the pandemic lockdown. The study further explored how online learning is shaping students' experiences. To generate data, an interpretive paradigm (Thanh and Thanh, 2015) was used to define, through interviews, students' experiences, and opinions about online courses. An interpretive paradigm was appropriate for the study as the aim of the research was to discover the students' understanding of what constitutes learning opportunities and challenges in the execution of emergency remote learning. The positive and negative aspects of the online learning environment as experienced by students are clearly defined. Using purposive sampling which forms part of non-probability sampling (Etikan, 2017), was used in selecting fifteen undergraduate students for individual interviews. The purpose of utilising purposeful sampling was to allow the researcher to select and identify information-rich cases to gain knowledge of student experiences regarding emergency online learning. To extract meaning from the data collected, semi-structured interviews were utilised to interview fifteen undergraduate students. As the interviews were conducted during the lockdown and the students were preparing for emergency online learning, therefore, telephone and email were used to conduct interviews. Participants were consulted and invited to participate in the study after an explanation of the whole process was given. For ethical issues, the study complied with the requirements, the researcher made sure that the participants understood the purpose of the study, and how their participation would be used to draw conclusions. The researcher used thematic analysis (Creswell, 2015) to interpret the data collected and categorised into themes. The following themes arose from the data: Challenges regarding online learning, Opportunities for online learning, Online learning post-COVID-19, and Overall experience during the lockdown.

Discussing The Results

The researcher is giving the demographic profile of the participants to outline the characteristics of the participants as that may have a possible influence in the study. During information gathering, the participants were asked to inform the researcher of their age so that the study would be informed about the characteristics of the participants. Below is the profile of the demographic characteristics of the participants: In terms of gender, the participants included eight (08) females and seven (07) males, making it 53% females and 47% males. Thus, the total number of participants was fifteen (15). The age of the participants ranged from 18 to 31. Creswell (2014) reminds researchers that participant identity needs protection at all stages of the research, from site selection and recruitment, through to data collection, analysis, and publishing. Therefore, when referring to the participants' responses, the researcher gave the participants pseudonyms: The eight females were referred to as reflected on P1- P8 and males on P9 -P15. To facilitate a comparison of the different views and perspectives, the researcher grouped the themes emanating from participants' views. The following themes arose from the data:

Challenges Regarding Online Learning
The sub-themes regarding the challenges of online learning are discussed below:

Interaction between teacher and learner
When students were asked to respond regarding face-to-face interaction and the online learning environment: "*I think there are drawbacks since there is no more interaction between teacher and learner*" (P4). "*There are certain issues that needed to be clarified which I did not understand and due to prohibitive data cost, I ended up not pursuing the matter further with the lecturer*" (P10). "*But for a self-independent study, you especially lose focus and direction from interacting with lecturers*" (P15). The absence of other learners and separation from them, as well as lack of live interaction, are concerns in digital learning. As much of the online curriculum is digital, thus compelling students to participate from diverse localities, this could result in students having a feeling of separation (Plotrowski, and Vodanovich, 2000). Studies determine that the online setting should promote group work to stimulate learning and produce a learning society that is distinctly diverse from several face-to-face learning curricula (Benhunan-Fich, and Arbaugh, 2006; Picciano, 2017). This development comprises participants learning through collaboration with their peers (Rovai, 2002]. The majority of P1-P8 mentioned that since they have become participants in online learning, most of them consider it challenging. Howland & Moore (2002) avouched that learners generally felt that accessing clarity on assignments, etc., was difficult due to the lack of interface between learner and lecturer (Davidson, 2004).

Curriculum delivery

When students were asked to respond to curriculum delivery: *"As a student who grew up schooling in the deep rural areas, I find online learning to be difficult and challenging" (P3).* Institutions assuming a smooth transition between online learning and lecture hall discourse must also acknowledge that some students come from disadvantaged backgrounds (Hanifah *et al.* 2019; van Deursen and & van Dijk 2019). If online learning is to succeed, the skills development and enhancement course for lecturers and learners must be factored (Alsuraihi, 2016; Hughes et al., 2018). Participant pointed out: *"Another challenge was that lecturers announce today that tomorrow there will be a quiz or online test, but during the normal classroom teaching and learning days, lecturers would give at least a one-week preparation period" (P12). "But now if you get notified today and have to write tomorrow, and you happen to miss that notification due to unavailability of data, then you are in trouble" (P1). "The quality of the system is rather poor in instances where some quizzes fail to load questions, and when you log out or try to refresh, the quizzes are submitted automatically" (P2).* The majority of participants mentioned that they experienced difficulty in curriculum delivery and assessments (P4, P5, P6, P7, P8, P9, P14, P15). Koehler et al. (2004) stated that lecturers have to become an essential part of the curriculum plan, and ought to be alert that to only embed video or online quizzes onto online programmes is not likely to achieve better results for learners. Moreover, these tools will only be operational in so far as they enhance devices supportive of student education, such as enriching interaction (Bernard et al.., 2009), and helping students reflect on their learning. The authors reported that delayed communication is one other weakness of online learning and disadvantaged learning (Howland & Moore, Vonderwell, 2003; Dutton and Reisdorf, 2019). Instruction, when completed in a face-to-face setting, can provide ongoing immediate feedback to lecturers and learners concerning the content, its execution, and the learning experience as a whole (Linjawi. 2018).

Maintenance costs

Regarding the maintenance costs, the majority of participants asserted that maintenance costs for online learning exceed those of traditional courses since learning devices like notebooks, laptops, and smartphones are affordable to only a few (P1, P13, P5, P9, P4). Participants also mentioned network connectivity and technical infrastructure as other costly requirements of online education (P1-P15). Gonzales et al.. (2018) stated that according to the technology maintenance construct, even those who own laptops and cellphones do not always enjoy full reliance on them. Those who still rely on outdated computers or dial-up Internet access at home may have to contend with untold disruptions when trying to connect with most programme delivery platforms (Jaggars, 2011; Gonzales, 2016). As such, the real cost amount of a gadget accounts for only a lesser amount of the full price of the whole package, as one still needs to pay for hardware devices and peripherals, maintenance, and software permits (van Deursen and van Dijk 2019)**.** Rideout & Katz (2016) argued that unpaid monthly bills, slow and dysfunctional hardware and shared access often caused the problem of under-connectedness for disadvantaged communities who do have Internet access. According to the study by Linjawi (2018), participants at different levels in the study expressed a strong need for course training on the usage of technology for purposes of learning. Nestel et al.; (2010) in their study revealed that students were grateful for the delivery of devices by institutions of higher learning as the device conveniently enables access to a variety of online materials.

Socio-economic inequalities

Regarding socio-economic inequalities, participants indicated: "*Due to socio-economic inequalities, a significant number of underprivileged students cannot afford the constant purchase of data as some institutions do not allocate data allowances to students. For example, students come from many different backgrounds, some come from poor rural areas where families are extremely poor*" (P7). Participants pointed out that poor network coverage, reliable devices and the cost of data is the main problem (P3, P5, P7, P8, P9, P10, P11, P13, P15). (Jaggars,2011; Rideout & Katz, 2016) stated that even though "digital divide" is no longer a major issue, low-income families are still significantly affected when it comes to advanced institutions necessary for digital learning participation. As much as most of the lower-income sector do make use of technological devices lately, the quality of access is unreliable and subject to constant interruption (Gonzales, 2016). "*A constant rise in the general use of online education can be envisaged as the majority learners belong in rural universities that do not provide the required digital tools that students need to sustain their use of online learning equipment such as data for assignment research*" (P1). According to Gonzales (2016), even though most people now have access to the Internet, their vast numbers do not necessarily imply that they can consistently maintain internet access. "*Regarding Zoom, those meetings are good for someone who has their study room, and that is not a privilege we all have. You may find that you would be disturbed by family, especially the little ones, whilst in the meeting and miss out on some information given during the meeting* (P9)". "*Unfortunately, with lockdown regulations, one could not even go to a local library*" (P11). Jaggars (2011; van Deursen & van Dijk 2019) indicated that those with inadequate home set-up might go and seek help from a neighbour's house, an Internet café, or the library. To work towards developing a holistic change, higher institutions might start by first seeking to understand students' digital perspectives, and then to understand other classroom conditions that may be relevant to digital equity and future learning readiness in specific modules. (Hughes et al., 2018).

Opportunities Of Online Learning

Regarding opportunities of online learning, the participant indicated: "O*nline education can be used by students as an empowering tool for personal independence, particularly those unable to fund their programmes. They can study online while working and providing for their households*" *(P14).* Hanifah *et al. (*2019) averred that the internet is an ever-growing resource that keeps increasing over time, and whose value to society is on a constant growth path. "*An opportunity was that the current tests have been short and easy to pass. Unlike before when tests were two to three hours long with some questions being vague, we now have a 20- minute test that is straight to the point*" (P10). Findings from studies indicated that assessing and supporting the needs of students is an outstanding concern regarding accomplishing online learning results and advancing knowledgeable students (Linjawi, 2018, Bernard et al.., 2009). Students consider online learning to be a suitable substitute for face-to-face learning (P13, P14, P5, P8). "*It improves good communication and promotes teamwork*" (P11). Studies mention that cooperative activities must be introduced to online education so as to increase social presence for students, decrease their emotional state of isolation and increase a sense of online society (Benhunan-Fich, and Arbaugh, (2006, Plotrowski, and Vodanovich, 2000). "*Online reading exposes students to*

diverse types of manuscript, and lessens the amount of time spent on research. It takes away the necessity to go to lecture halls, pay rent for accommodation, and other such expenses. One switches on one's laptop and lessons start" (P5). By the same token, the online medium gives learners capacity to be updated about their curriculum and activities at their own will (Swan, 2017).

Learning After the COVID-19 Pandemic

Regarding online learning after COVID-19 pandemic**:** *"Definitely there shall be slow economic recoveries, the virus is here to stay so we are going to resort to a new normal; wearing a mask and sanitizing will be the order of the day "(P4).* *"No, I don't think things will go back to normal after COVID-19 because we will still be required to practice social distancing and other safety majors until there is proof that the COVID-19 virus has disappeared" (P3).* Participants believe that higher institutions and organisations will accept digital learning as a norm, seeing that the 4th industrial revolution (4IR) has arrived (P3, P4, P6' P7, P9-P15). *"The fact is that even though e-learning is now introduced to address the issue of COVID-19, the world will change after this pandemic" (P12).* *"People need to be flexible; we are now in the new era where 4IR is in control" (P13).* *The* adoption and implementation of digital learning in teaching can no longer be disputed as this will become the model of the future (McAndrew & Johnston, 2012). *"I believe that the integration of information technology in education will be further accelerated and that online education will eventually become an integral component of higher learning institutions and this will result in the rise of online courses" (P4).* The literature has shown that the adoption of technology in education has resulted in enhanced learning attitudes by learners, lecturers' technology skills development, and accelerated society's access to literacy and learning (Bernard et al.., 2009). Similarly, Sheffield (1996) affirmed that due to the current advances in online tools, learning and teaching has become more dependent on technological devices. In this sense, Hanifah *et al. (*2019) stated that lecturers should recognise the influence of technological changes to the modern community and endeavour to incorporate this transformation in their specific teaching practice.

Overall Experience During Lockdown

Regarding the *overall experience*: *"My overall experience is that online learning is a bit hard" (*P1)*.* *"Some of the methods of online learning that I enjoyed was the one by our lecturer who made downloadable voice recordings during the time of his lessons'' (*P10)*. He taught according to the timetable that we used before lockdown, and that meant he was traceable and made it easier to have a timetable that you can show to your family on when not to be disturbed" (P8).* According to a study by Nestel, et al. *(2010) l*earners asked for extra online activities, especially audio-visual resources, a more logically arranged virtual learning environment, and more flexibility in accessing materials. *"The harder side of online learning is that some notes, slides, and notifications are posted anytime, anyhow. But if perhaps more lecturers used this method, then it would be easier if you know when to make sure you have data, when to make sure you are in a spot where there's connectivity, and when to let your family know the times when you are not available" (P5).* Participants revealed that poor network service provision hindered full participation in learning activities and assessments (P1-P15). *"When the network coverage is down, I will not be able to participate to complete my assessments'' (P6).* Tsetsi and Rains (2017)

revealed that lower-income students may only access the Internet on their smartphones, however, higher-income students are able to access the Internet on their various devices. "*As I'm locked down at home right now, sometimes I feel psychologically drained and uncertain if I'll be able to complete my 2020 academic year" (P12).* Computer anxiety and other such undesirable approaches diminish one's will to access the online tools (Dutton and Reisdorf, 2019; Van Dijk, 2005).

Limitation Of The Study
The researcher was unable to reach all the participants since some were not accessible on their communication devices. As a result, not all the participants were interviewed as planned due to connectivity challenges.

Conclusion
The purpose of this research was to examine learners' experiences of an emergency online learning activities during the COVID-19 pandemic lockdown. The results revealed that online learning promotes socially-defined exclusivity in terms of accessing digital devices, data cost, poor network coverage. Students from low-income backgrounds especially in poor rural areas are negatively affected. For higher institutions not to be caught unprepared by future pandemics, they need to offer online learning support of high quality and that is easy to access, especially to students from low-income families. The study also revealed that most of the female students experienced difficulties in online curriculum, such as the absence of interaction between student and lecturer. On distance learning, theorists also argue that as a mechanism to involve and encourage students, distance courses should explicitly promote social or emotional connections at teacher-student as well as peer-peer levels (Garrison, Anderson, & Archer, 2003). The study recommends student digital readiness, affordable devices, and internet connectivity to be a number one priority, and equipping students with online skills at the entry-level of their registration will boost their confidence and improve their performance. Although the majority of male students felt that they have already been introduced to 4IR, it is highly recommended that the Higher Education equally provides the institutions with the required resources and basic infrastructure for unforeseen emergencies.

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Business School Students' Challenges and Coping Strategies during the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic is a global concern, affecting both academics and students at Higher Education Institutions. Universities worldwide have had to shift to online teaching. In the online learning environment, students had to use different technologies to complete their studies, adjust to working from home and cope with the pandemic challenges. Student stress levels and coping skills have become paramount. During any stressful life experience, both positive and negative affect co-occurs. There is a need to engage and access the positive side as soon as possible, because positive affect has adaptation significance. It helps to deal with stress effectively and overcome its harmful consequences quickly. This study investigated the challenges, difficulties and coping strategies and mechanisms of students, during the COVID-19 pandemic, at the Nelson Mandela University Business School. A qualitative survey was conducted amongst Business School students and 106 responses were thematically analysed. A machine-learning algorithm was developed to analyse and cluster the data. The findings indicate that the students were generally badly affected by the lockdown, found it difficult and frustrating at times and experienced problems with data costs, connectivity and the use of new technologies. They were generally satisfied with the way the Business School managed the conversion to the online environment. The contribution of this study is using a machine learning approach for thematic and text analysis. Recommendations are provided for business school management on managing stress and coping during uncertain times.

Keywords: COVID-19, Business Schools, Crisis, Challenges, Coping Strategies

Introduction

Stress in education is a given and in 2020, stress has increased due to the COVID-19 pandemic. Stress and coping are widely researched fields in the field of psychology, but have received increased attention in higher education (Pascoe, Hetrick & Parkera, 2020). Stress is defined as a particular relationship between the person and the environment, appraised by the person, as taxing or exceeding his or her resources and endangering his or her well-being (Lazarus & Folkman, 1984). Writers in the field acknowledge that stress is to some extent a normal, even inevitable part of the process of development that takes place at a tertiary level (Murray-Harvey et al., 2000). Stress amongst students is multifactorial arising from both academic and non-academic factors, including socio-cultural, environmental and psychological attributes (Brand & Schoonheim-Klein, 2009).

Tertiary education life is stressful in terms of commonplace stressors (Pascoe et al., 2020). Students routinely face such challenges as changes in their environment, loss or diminishment of previous social support networks, new and increased academic pressures, the need to create new peer relationships and increases in personal responsibility in housing, food and money management (Vaez & LaFlamme, 2008). In South Africa, external stressors such as the rate of crime amplify this, together with gender-based violence and other traumatic events coupled with inefficiency and corruption in state departments (Draper-Clarke & Edwards, 2016). Students go through these stressors with a responsibility to excel (Amponsah et al., 2020).

Galatzer, Burton and Bonnano's (2013) study on university students focused on flexible coping, which they defined as the ability to both focus attention on stressful material and the ability to focus attention away from the same material. This would predict resilience in individuals adapting to university. Studies amongst medical students reveal that varying degrees of stress may affect the student's overall functioning and performance (Govender et al., 2015). If the demands imposed by stressors exceed the capacity of individuals to cope, they can result in burnout, psychological stress and physical illness. They can however, also evoke a sense of challenge and satisfaction and give meaning to life (Draper-Clarke & Edwards, 2016).

A key variable in the process of minimising, reducing or tolerating stress is recognised as coping (Gustems-Carnicer & Calderon, 2013) and it is a strong predictor of academic success (Barrows, Dunn & Lloyd, 2013). Coping refers to the thoughts and behaviours people use to manage the internal and external demands of stressful events (Folkman, 2010). There are three aspects of coping, firstly, emotion focused coping refers to the thoughts and actions people use to manage stress. This includes strategies such as social support, humour and distancing. Secondly, managing the problem causing the stress (problem-focused coping), which includes seeking advice, gathering information and drawing on previous experience and problem solving. Thirdly, focused coping sustains positive wellbeing (Okoro, 2018; Folkman, 2010). Studies focusing on stress and coping included both qualitative and quantitative data.

Qualitative research is generally analysed using thematic analysis. Jonsen and Jehn (2009) describe how three complementary triangulation methods are used for validation and exploration of concepts and themes in qualitative studies. Different methods, such as inductive, deductive and semantic analysis methods can be used for coding and theme development (University of Auckland, 2020). Researchers use software packages, such as Atlas.ti and Nvivo to code, develop themes and graphically present textual data analysis. The presentation of the results generally includes key findings under each main theme, using appropriate verbatim quotes to illustrate the findings and different graphical diagramming techniques and graphs. In this study, a machine-learning algorithm was developed to analyse, cluster the text and present the analyses.

The problem addressed in this study was that students' coping ability because of the COVID-19 pandemic has not been assessed. The aim of the study was to determine the opinions of students at the Nelson Mandela University (NMU) Business School regarding the transition to online and how they were coping with their studies during the lockdown. The sample included students residing in Port Elizabeth and *'Block'* students, i.e. students travelling from other parts of the country to attend block lectures. Higher Education Institutions (HEIs) need to develop a

comprehensive plan and a rigorous follow-up scheme to ensure that academics and students make proper use of digital platforms. Investigating the opinions of students at this stage should give insight and inform the way forward.

Background Literature

Stress is best portrayed as a situation where normal requirements exceed the limit concerning the prevailing response by a person and might perchance have physical and mental results (Rout & Rout, 1993). The management of stress is crucial for human endurance and can be characterised as taking care of outside or inside burdens that are affirmed as challenging on individual abilities and assets (Amponsah et al., 2020). Over the last five years, students in South Africa have been exposed to two occurrences, which created stress and saw the suspension of classes without the suspension of learning.

In 2016, South African HEIs had to cope with the #FeesMustFall protests. The student protests had a negative impact on the quality of education, which influenced their overall learning experience (Greef, 2020). In addition, the occurrence of strikes and protests created concerns regarding student safety on campus (Naicker, 2016). The protest action challenged the completion of the academic year and certain initiatives, which included online and off-campus course offerings, were put in place to save the academic year. In addition to the disruption, universities were placed under financial pressure, which meant they had access to less funds to maintain quality educational services (Butler-Adam, 2016).

Not since World War II, have so many countries around the world seen schools and higher education institutions go into lockdown around the same time and for the same reason. COVID-19, the infection caused by a novel coronavirus detected in December 2019 in Wuhan China, is now a pandemic announced by the World Health Organisation (2020), raising concerns of widespread panic and increasing anxiety in individuals. COVID-19 has disrupted virtually every aspect of daily living (Polizzi, Lynn & Perry, 2020). Coping with COVID-19 is particularly complicated for universities, because they provide such a wide variety of functions (Illanes et al., 2020).

A major adverse consequence of the COVID-19 pandemic is likely to be increased social isolation, loneliness and a lack of human interaction, which are strongly associated with stress and anxiety (Kant, 2020). Mental health services on campuses have been expanded given the anxiety and distress caused by COVID-19. With less people on campus, institutions have implemented strategies to assist staff and students, including video recordings from mental health professionals, partnerships with telehealth and tele-counselling providers and access to online mindfulness classes and applications (Heitz et al., 2020). The stressors from COVID-19 include self-isolation, infection fears, frustration, boredom, inadequate supplies and information, financial loss and possibly job loss. Added to this, for students, is the possibility of not being able to complete the academic programme (Brooks et al., 2019).

Isolation, a signature of the COVID-19 epidemic, places unique and severe strains on the ability to remain resilient. Normally, communities join together in times of disaster, however the COVID-19 pandemic, has forced people to be apart. This isolation has taken away the social

connectedness that people are used to. In the university environment, this has affected face-to-face teaching, study group meetings and discussion forums, which are an integral part of the academic world. On the social level, eating out, social gatherings and interacting with friends, have all been affected (Polizzi, Lynn & Perry, 2020). Chew et al.'s (2020) research found that feelings of isolation and depression often arose because of having to be self-isolated.

Experienced stress brought on by not coping with external stressors and not coping academically is a substantial barrier to students' academic achievement (Vaez & LaFlamme, 2008). Eighty nine percent of students surveyed in India, accepted that their quality of learning and teaching was affected by the COVID-19 lockdown (Kant, 2020). The external stressors are abundant and everyone has to worry about their health and that of their family. People have extended family members, colleagues and friends who have contracted the virus. Everyone has family responsibilities (attending to our homes, home schooling children, etc.) and demanding workloads (Foxcroft, 2020).

The outbreak of the virus and lockdowns at the national level could be used as a best test for the education technology interventions for distance learning, however few systems arrived at this point fully prepared (Azzi-Huck & Shmis, 2020). The rapid spread of the COVID-19 virus has demonstrated the importance of building resilience to face various threats, from pandemic disease to extremist violence to climate insecurity and rapid technological change. The pandemic has also created the opportunity to remind academics of the skills students need in an unpredictable world, such as informed decision-making, creative problem solving and adaptability. To ensure those skills remain a priority for all students; resilience must be built into the educational systems as well (Tam & El- Azar, 2020). The current challenge is to successfully meet the needs of students, while at the same time maintaining the integrity of the academic programmes (Murray-Harvey et al., 2000).

Research Methodology

Qualitative research, specifically text analysis is generally analysed using thematic analysis and latent semantic analysis. Latent semantic analysis is a technique in natural language processing, in particular distributional semantics, of analysing relationships between a set of texts and the terms they contain by producing a set of themes related to the text. The presentation of the results from the text analysis includes key findings under each main theme, using appropriate verbatim quotes to illustrate the findings and different graphical diagramming techniques, network graphs (Figure 1) and word clouds (Figure 2).
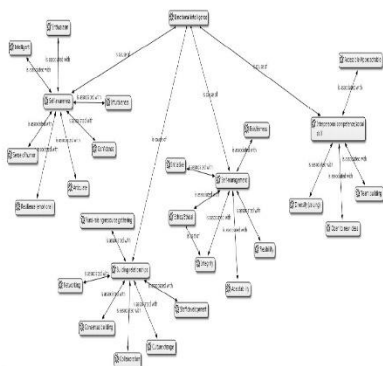
Figure 1: Atlas.ti network diagram

Figure 2: Word cloud

The research philosophy used in this study was interpretivism, the guiding paradigm and approach was qualitative, inductive and exploratory. Interpretivism helps with the interpretation of how people participate in social and cultural life (Saunders, Lewis & Thornhill, 2019). The inductive approach allows the process to follow from research questions to observation without reference to any existing theory. This exploratory study was one of many investigations on the impact of COVID-19 at HEIs. The survey questions, listed below, were formulated to determine how students were coping, how they thought the business school was coping and suggestions as to what the business school should do going forward at this time of uncertainty:

- How has your industry been affected by the lockdown?
- How are you finding studying online during this period?
- What difficulties have you encountered relating to your studies during this period?
- What measures have you put in place to ensure that you keep abreast of your study requirements?
- How would you like to see the rest of the academic programme being managed?
- What suggestions do you have for the Business School?
- How did social distancing, studying online and working from home make you reassess the importance of human interaction?
- What is the single most important aspect that you will take home from this experience?

Participants were asked to complete an online questionnaire and provide general information about their demographics. The questionnaire was distributed to the students at the NMU Business School. There are three cohorts at the business school. The PDBA (Post Graduate Diploma in Business Administration), MBA first years and MBA second years. There are approximately 300 students registered at the school. One hundred and six students responded, which translates to a response rate of 35%.

In order to analyse the qualitative responses, thematic analysis was conducted (University of Auckland, 2020). Extracting trends from text responses is normally achieved by grouping comments containing the same keywords together as themes. These clusters of grouped responses would ideally contain similar comments that can be viewed by the researcher to identify sentiments shared by several respondents. A simple strategy for creating clusters would be to compute the largest sets of responses that contain the same text or keywords for each

question. However, this strategy ignores the information content of the clusters and would result in either a very large number of groupings to inspect or, when smaller groupings are omitted from the set of clusters, the omission of valuable information present in the responses of small groups of respondents is lost.

To illustrate the problems with the simple strategy, consider the dataset used in this paper, which contains 193314 potential groupings of responses that contain the same keywords (this number excludes clusters that would have been formed in the absence of a stop list (Baeza-Yates & Ribero-Neto, 1999), which prevents clustering on irrelevant keywords like *am*, *at*, *and*, *an*, etc.). This number of clusters is clearly too large for a researcher to inspect, so the researcher is left with no choice but to remove all clusters that are subsets of bigger clusters. For example, if Respondents 1, 7 and 14 all used the keyword *work*, the cluster containing all three respondents would be retained while clusters containing only 1 and 7, 1 and 14, and 7 and 14 would be removed because they are subsets of the larger cluster.

Applying this strategy, would reduce the number of clusters from 193314 to 503, which is a much more realistic number for the researcher to inspect. Unfortunately, a problem occurs when subsets have more keywords in common than the larger set. Consider the situation where Respondents 1 and 14 also used the keyword *office* in addition to the word *work* used by all three respondents. Blindly removing the cluster 1 and 14 will result in the researcher's attention not being drawn to the potentially valuable information that two of the respondents used both at work and *office*. One could be more selective when removing subset clusters by not removing clusters that have more keywords in common than the superset, however, this may also result in too many clusters being retained (a total of 5306 clusters in the dataset used in this paper).

A method based on the theories from the field of information retrieval is proposed in this paper to make the cluster forming process more tractable. Salton's Vector Space Model (VSM) (Salton, Wong & Yang, 1975) is the foundation of the approach. In its original form, the VSM is used to calculate the similarity between a document and a search query in an information retrieval system. This similarity score is used to rank query results in order of most relevant to the user. The similarity between a query, *q*, and the *j*-th document is calculated as:

$$sim(q, j) = \frac{\sum_{i=1}^{n} w_{i,j} w_{i,q}}{\sqrt{\sum_{i=1}^{n} w_{i,j}^2}\sqrt{\sum_{i=1}^{n} w_{i,q}^2}}$$

where *n* is the total number of keywords under consideration (so *i* refers to the *i*-th keyword) and $w_{i,j}$ is the weight of keyword *i* in document *j*, calculated as:

$$w_{i,j} = \frac{F_{i,j}}{F_{i,j}} \cdot \log_{10} \frac{N}{f_i}$$

where $F_{i,j}$ is the frequency of keyword *i* in document *j*, *N* is the total number of documents and f_i is the number of documents that contain keyword *i*. The weight is thus calculated as the relative frequency of the keyword in the document scaled by the logarithm of the inverse of the keyword's frequency in all documents. The VSM aims to assign a high similarity score for search terms that occur frequently in the target document but not frequently in other documents.

The method suggested in this paper makes use of an adapted VSM similarity score to calculate a cluster score, *CS*, for each response cluster as follows:

$$CS = \sum_{k=1}^{C} \prod_{i} F_{i,k} \cdot \left(\log \log \frac{N}{f_i} \right)^2$$

where *C* is the cluster size (so *k* refers to the *k*-th response in the cluster), $F_{i,k}$ is the frequency of keyword *i* in the *k*-th response and f_i is the number of responses to the same question that contain the keyword. The cluster score is used during the subset elimination process described earlier. Subset clusters are only removed if they have a smaller cluster score than the superset. The intention of this technique is to prevent the removal of subset clusters that contain valuable information. The proposed method yielded a total of 920 clusters on this paper's dataset. An additional benefit of the cluster score value is that clusters can be presented to the researcher in descending order of score, thus emphasising the expected pertinent clusters.

Results

A total of 106 NMU Business School students completed the survey (35% response rate) during Level 5 lockdown in South Africa in 2020 (Table 1). The students, male (46%) and female (54%), resided in Port Elizabeth (49%) and the Block students (51%), mainly in East London, Gauteng, Cape Town and Durban. Thirty-eight students (36%) indicated that they had children at home and were working from home (70%, n=74), 36% were in essential services and 40% were PDBA and 60% MBA students.

Table 1: Demographic variables

Gender		Residence		Children at home	
Female	54% (n=57)	PE	49% (n=52)	Yes	36% (n=38)
Male	46% (n=49)	Block	51% (n=54)	No	64% (n=68)
Study status		Working from home		Essential services	
MBA 1st year	35% (n=37)	Yes	70% (n=74)	Yes	36% (n=38)
MBA 2nd year	25% (n=27)	No	30% (n=32)	No	64% (n=68)
PDBA	40% (n=42)				

Generally, the students (68%) indicated that the NMU Business School was coping well with the transition to online learning and 23% were unsure (Table 2). The PDBA students (78%) indicated that the Business School did well, however only 54% of the MBA 2nd year students indicated that the Business School was doing well. The students (52%) indicated that the university should be responsible for providing Internet and data services and more females (27%) indicated that the services should be for your own account (Table 3).

Table 2: Coping with transition to online

How well has the business school coped with the transition to online?	MBA 1st yr	MBA 2nd yr	PDBA	Total
Well	69%	54%	78%	68%

| Not well at all | 15% | 13% | 2% | 9% |
| Unsure | 17% | 33% | 20% | 23% |

Table 3: Responsible for online studies

Who should be responsible for providing the tools (data, Internet) to study online?	Male	Female	Total
Government	24%	30%	27%
Universities	62%	44%	52%
For your own account	15%	27%	21%

The respondents worked in different industries, with 20 in Government, 16 in automation and 14 in financial services (Table 4). A word cloud of data is presented in Figure 3.

Table 4: Industries represented

Industry	n	Industry	n	Industry	n
Automation	16	Education	7	Government	20
Manufacturing	12	Financial	14	IT, Networks	5
Construction	10	Medical	13	Other	14

Figure 3: Industries represented word cloud

The main themes and their inter-relationships (Figure 4) on how the industry, the Business School students worked in, were affected by the lockdown, showed that 49 companies had a total shutdown and were badly affected by the shutdown (n=28). The companies badly affected by the shutdown (n=49) also experienced total financial loss (n=17). Twenty-eight companies partially shut down, 20 students were working from home, the shutdown had a positive effect on seven businesses and two students were retrenched. Four students experienced total loss of personal financial income.

The students indicated that they experienced "Loss of income due to clients not being able to make their monthly retainer payments", "Everything has come to a standstill, service delivery is postponed", "They are closed until further notice with employees earning 80% of their salary", "Closed, no production", "Manufacturing has been suspended" and "Retrenchment is looming". On the other hand, some respondents indicated that "Medicinal requests increased", "It has not been affected. Emergency Medical Services is an essential service" and "I am in Pharmaceuticals and as such we are working in these trying times. The demand has increased".
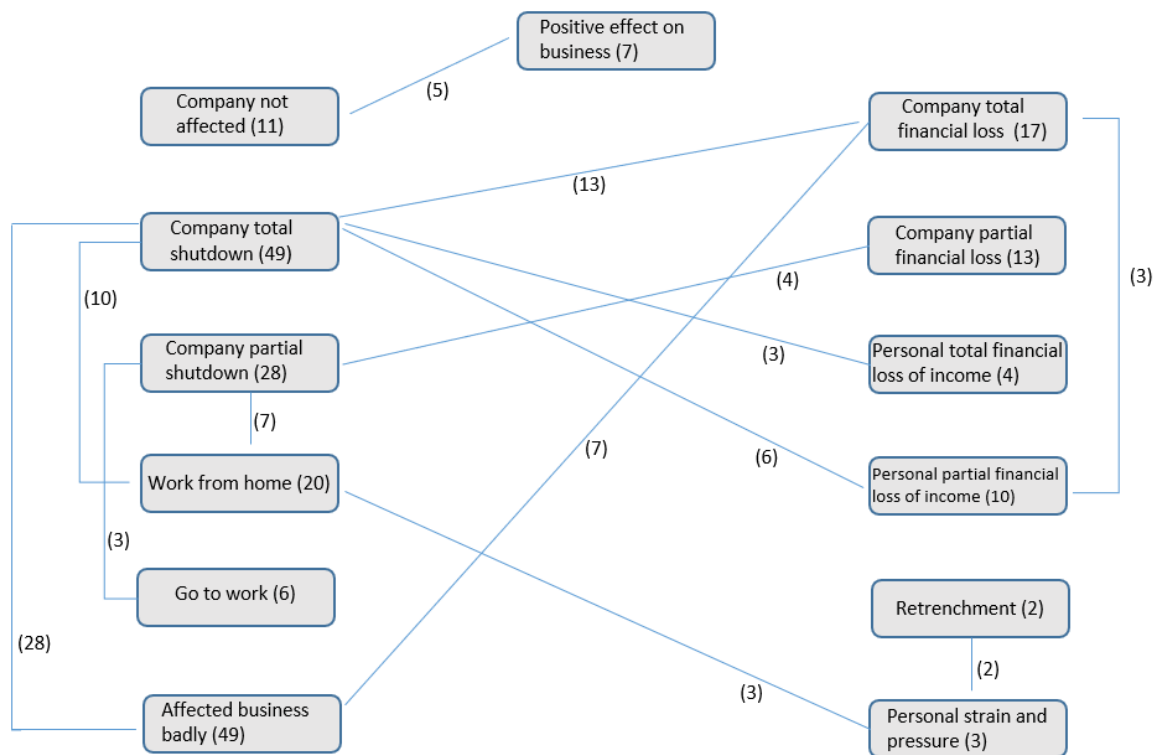
Figure 4: How has your industry been affected by the lockdown?

The students (Figure 5) found studying online difficult and frustrating (n=33), challenging (n=27) and preferred face-to-face interaction (n=15). The students who indicated the "OK" (n=26), also enjoyed online education (n=12) and experienced no change (n= 14). The challenges they faced included data costs, work commitments and working with family and children at home. The comments included from students were "Limited contact sessions means less engagement with lecturers. This has hindered the overall experience of being an MBA student", "It is hard, must have a lot of data for the online streamed lectures and not much class engagement", "Difficult and frustrating", "Very stressful and has put unnecessary burden particularly with typing during tests" and 26 students indicating "It is not too bad" and one saying "Great! I have more flexibility".

The difficulties they experienced (Figure 6) included technological (n=24), connectivity (n=20), data costs (n=17), missing face-to-face interaction (n=18) and library access (n=8). Working from a home environment, brought its own set of problems, having to deal with family and children (n=10), completing work activities and dealing with stress and emotional challenges. Sixteen students (15%) experienced no difficulties. The respondents indicated that they were "Totally dependent on availability of electrical power", "Working from home is difficult. My family does not understand that they should leave me alone and keep noise levels low", "Not being able to engage in group discussions" and "writing tests from home and uploading them on the business school online platform, Incoko" were problematic. They experienced a "Change in the learning technique" and problems with "Data and network connectivity", "Miscommunication" and

"Uploading tests scripts, panicking, network failure". The voice-over PowerPoint slides were perceived as very helpful, as well as using Zoom and Teams.
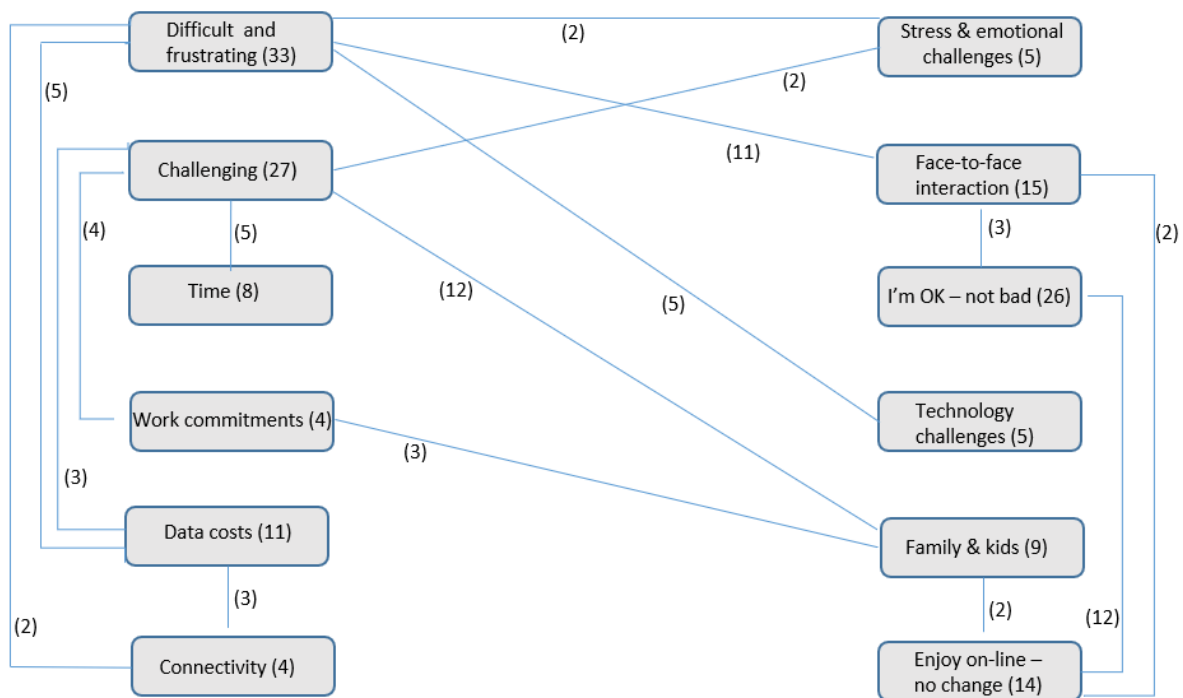
Figure 5: How are you finding studying online during this period?
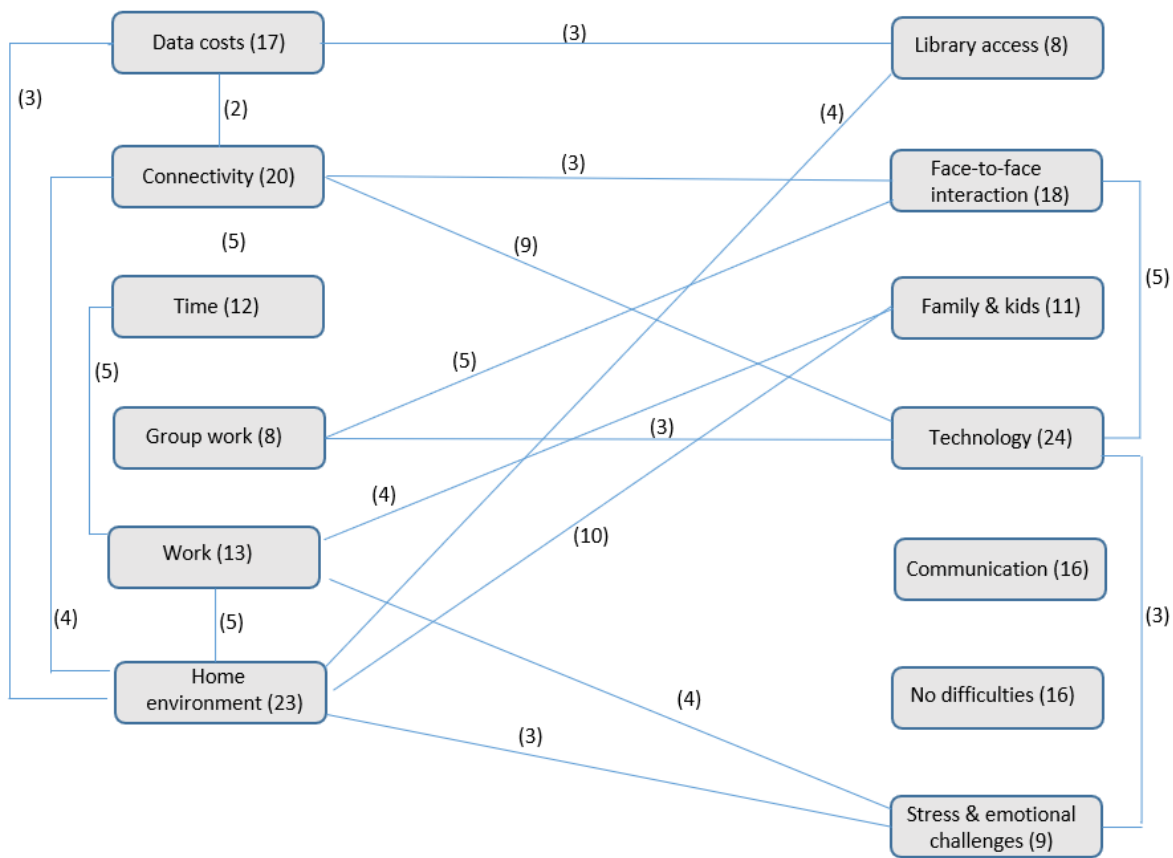
Figure 6: What difficulties have you encountered relating to your studies during this period?

The measures students put in place to keep abreast of their study requirements (Figure 7), included implementing a work schedule (n=54), buying data reserves (n=11) and working at night (n=10). They checked their emails, etc. regularly (n=24) and used the study group for support ((n-21). Having a dedicated work environment at home was also important. They stated that they "Constantly checking emails, checking study material updates on Incoko", they use "daily planners" and "timetables" and invested in technology, "I bought a laptop" and "Buying a flatbed scanner".
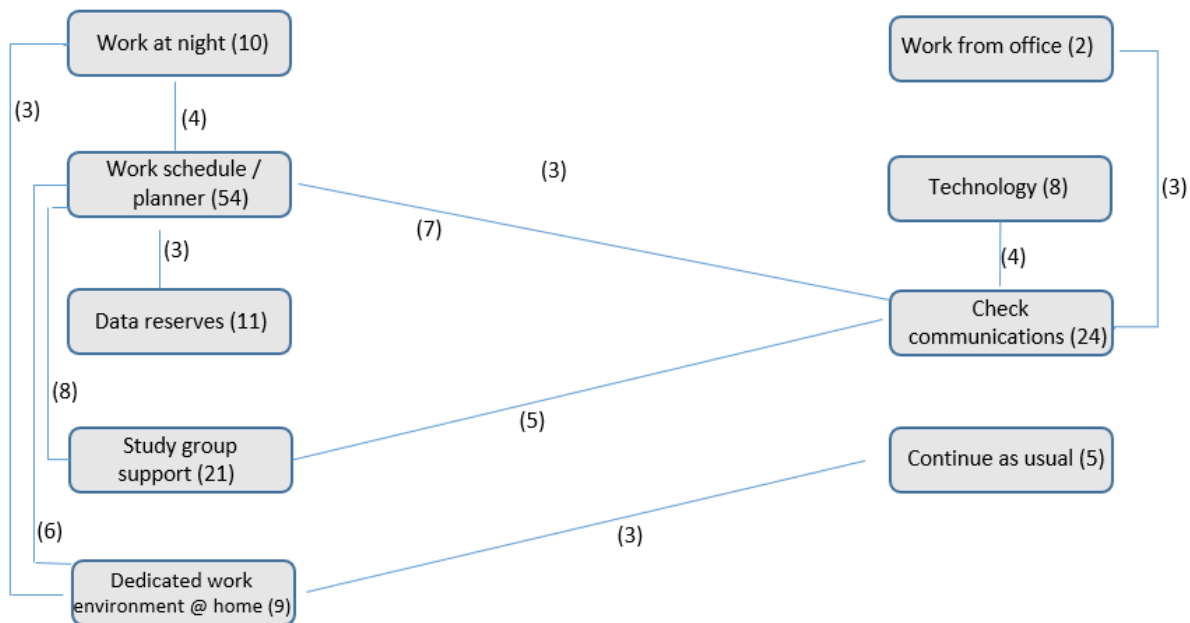
Figure 7: What measures have you put in place to ensure that you keep abreast of your study requirements?

They see the rest of the academic programme for the year to continue in the current format (n=39), using virtual classes (Zoom and teams) and staying online (n=26). They would prefer face-to-face lectures and assessments, all lecturers to provide voiceover Power Point slides and increased communication (Figure 8), as students stated that "Timely communication has been an issue".
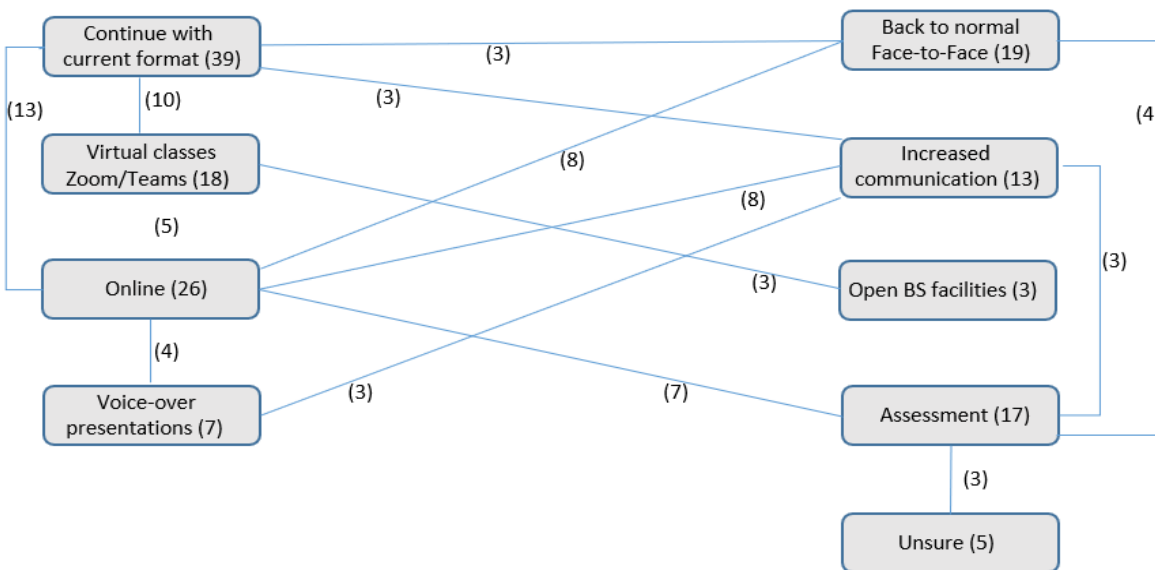
Figure 8: How would you like to see the rest of the academic programme being managed?

The suggestions they have for the Business School included increased support and communication, using different online resources and upskilling of all lecturers to use the available technologies, effectively (Figure 9). All lecturers should use a central learning material repository and record all lectures. They perceived writing tests and exams at home to be difficult and "More interaction. Making use of the available online resources to connect with students".
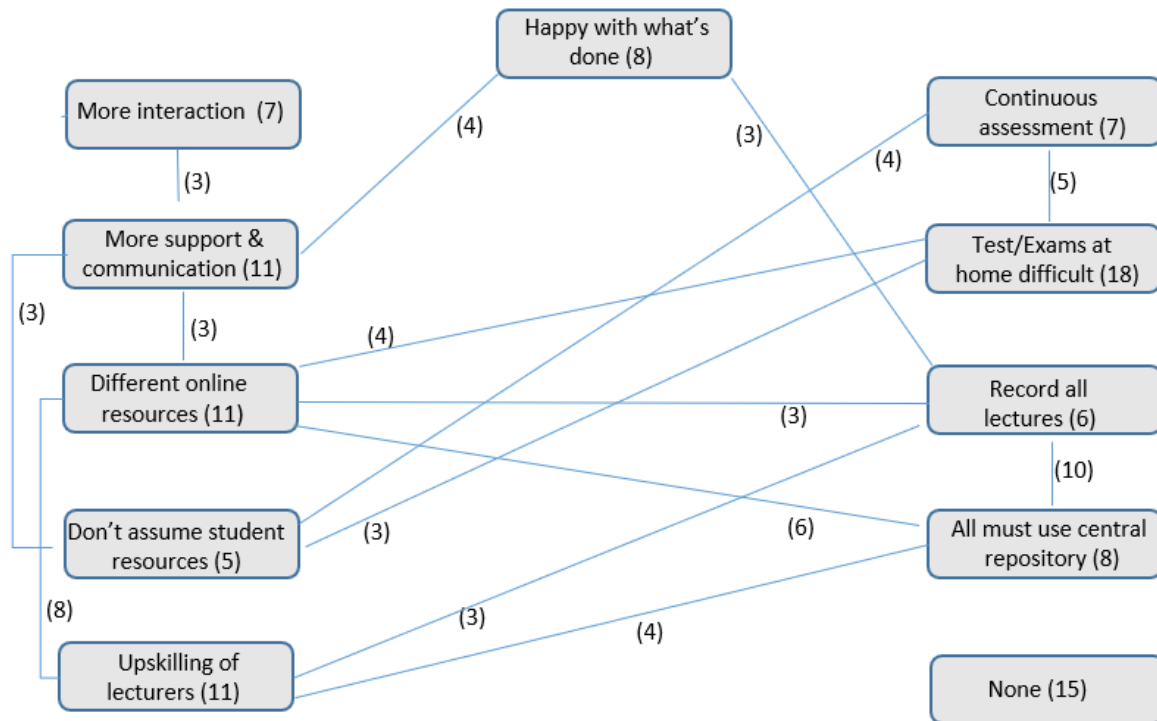
Figure 9: What suggestions do you have for the Business School?

The students highlighted the importance of human interaction and included that "Human beings are social beings, human interaction face to face is important" and it "makes me realise just how important human life is". They highlighted the importance of family and friends, communication and being psychologically stable (Figure 10).

The most important aspect from the lockdown experience was not to take things for granted (n=22), "Do not take freedom for granted" (Figure 11). "The simple things in life such as going for a jog or walking the dog". You are not in control (n=18), use opportunities and enjoy life and to manage your time (n=14) are important. Time management and discipline were highlighted by six students and to look after your physical and mental health. Hygiene was an important aspect, "be hygienic" and "Personal Hygiene is very important".
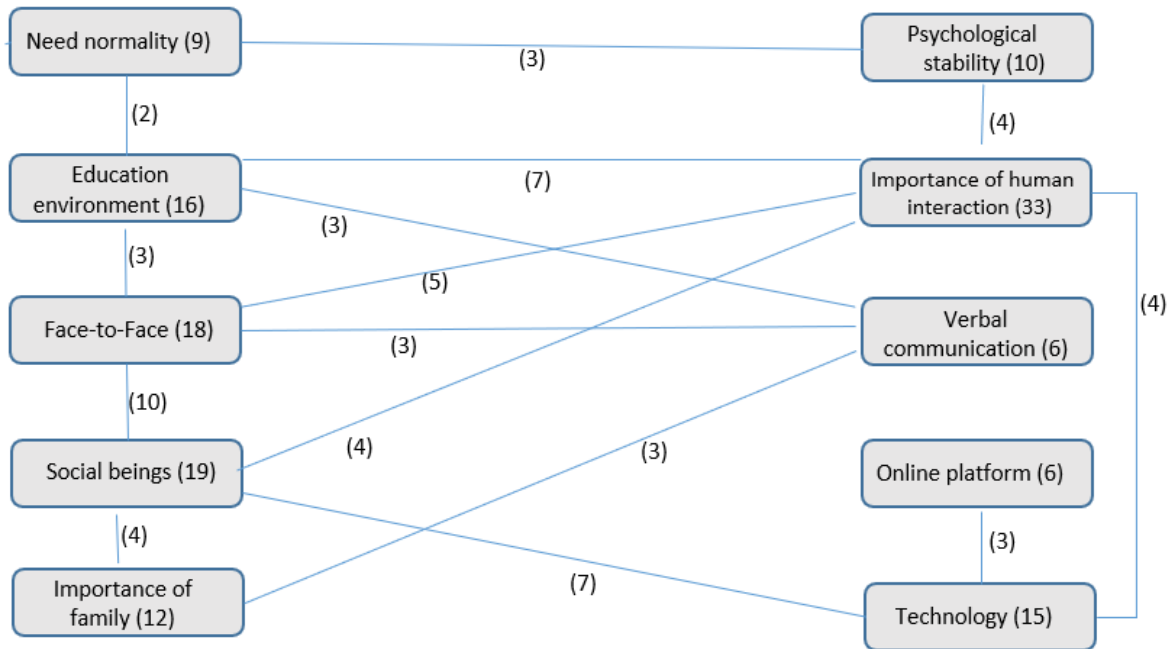
Figure 10: How did social distancing, studying online and working from home make   you reassess the importance of human interaction?
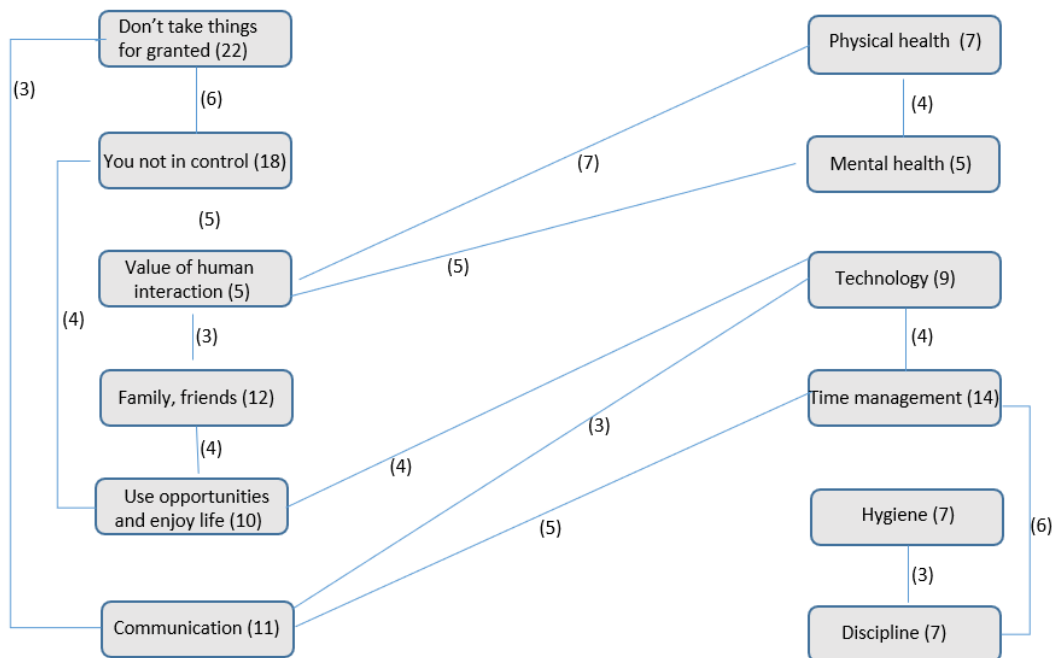
Figure 11: What is the single most important aspect that you will take home from this experience?

The comments received for the request: *Please include some comments on how you feel the Business School is coping with the academic project during lockdown* included "I think the business school is trying its best", "I think the BS is coping well", "The Business School is doing well under the circumstances" and "The business school is handling this well". Suggestions included were "The use of Zoom and access to recordings", "Some lecturers are coping far better than others" and "Always a quick response to emails". Other negative comments were "The BS does not have patience for students", "the school does not give feedback to students regarding complaints raised about certain modules", "Too little interaction between lecturers and students", "Timely communication has been an issue" and "do not assume that all the students have all the tools required for online lectures" were also mentioned.

Conclusion

The Higher Education sector presently faces great uncertainty. This study has investigated how Business School students were coping during the COVID-19 lockdown period. It is essential that HEIs be aware of how students and academics cope with the COVID-19 pandemic (Draper-Clarke & Edwards, 2016). The students were generally badly affected by the lockdown, found the situation stressful, difficult and frustrating at times and experienced problems with data costs, connectivity and the use of new technologies. As indicated in Figure 6, the stress and emotional challenges should be managed (Folkman, 2010). The students were generally satisfied with the way the Business School managed the conversion to the online environment and suggested the Business School continues using the current format.

The students, during this period, required more support and communication (Heitz et al., 2020) from the Business School. The PDBA students (78%) indicated that the Business School did well, however only 54% of the MBA 2nd year students indicated that the Business School were doing well (Table 2). The reason for the difference is possibly the different lecturers teaching on the different programmes and their different skills and experience with the use of online technologies. The lessons they learned from the experience were not to take things for granted and to use opportunities and enjoy life. They indicated the importance of time management and hygiene.

HEIs and specifically Business Schools must take cognisance of the fact that students are experiencing increased stress and require additional support and assistance with coping strategies during crisis situations. Business school students have additional family and work commitments. Effective communication methods must be used, specifically when using online presentation and assessment technologies. Staff and students require training and assistance when using new online technologies. Business School management must ensure that the teaching philosophy, standards and outcomes are maintained.

The thematic analysis conducted using machine learning in this study has highlighted the inter-relationships between themes and provided additional data on how many respondents mentioned associated themes. These new information rich diagrammatic presentations provide more numerical information than word clouds. A limitation of this study is that only 35% of the students responded to the survey. Future research will re-examine the COVID-19 impact, also

validate the novel text analysis technique using machine learning and introduce detailed theme clouds.

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The Factors that Influence South African Students' University of Choice Decisions

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Abstract

The increased competitiveness in the higher education sector and the need for Higher Education Institutions (HEIs) to become more autonomous and self-funded, has amplified the need to recruit national and international students. International students generate additional income for HEIs. Furthermore, the strategy to recruit national and international students has evolved and transformed into a customer-driven strategy to meet the needs of the knowledge economy. Recruiting national and international students requires HEIs to invest in marketing and recruitment strategies, which build brand awareness and attract a diverse student body. Previous international research has identified factors, such as quality of programmes, ranking, location, accommodation and transport, fees and living expenses, university brand and student and social life as influential in the decision-making process. The COVID-19 pandemic has had a major impact on national and international students, specifically the travel restrictions implemented by various governments. HEIs have been forced to implement an on-line or blended learning approach to course offerings.

In this study, the factors that have an influence on students' university of choice decisions were investigated. A combination of descriptive and inferential statistics was applied to analyse the quantitative data received from 2909 respondents. The results indicated that the factors related to academic quality and programmes, financial aspects, student life, location and reputation were all influential in the students' decision-making process. The study could assist South African universities in the recruitment of national and international students by focusing on the factors, which influence a student's university of choice. The contribution of this study is a model which could assist university marketing management in implementing appropriate marketing and recruitment strategies.

Keywords: Student Recruitment, Internationalisation, Factors, University of Choice, South Africa.

Introduction

Massification and commercialisation of higher education has led to an increase in the number of Higher Education (HE) students globally (Boshoff & Quinlan, 2016). In 2017, there were five million students studying outside the borders of their home country (StudyPortals, 2017). The

Organisation for Economic Co-Operation and Development (OECD) found that in 2018, 44% of 25 to 34 year-olds held a tertiary qualification, compared to 35% in 2008 (OECD, 2019). Due to this competitiveness in the HE sector, the evolving economic climate and government and industry needs, universities are amidst a vehement scramble for students originating from various parts of the globe (StudyPortals, 2017).

Even though student mobility has grown, an increase in study options (StudyPortals, 2017) also means that students can now study at their university of choice, whether that means studying online or travelling to distant countries and continents (ICEF Monitor, 2015). With numerous study options available, various factors influence a student's choice of university. These factors differ from country to country as culture, educational needs, campus activities, safety and security and socio-economic issues, such as economic downturn and country instability, all have various degrees of influence on a student's choice of where to study. The recruitment of students has become a challenging and competitive process in which an institution must not only promote itself, but also its offerings (education), as well as the ability of its graduates to function in an ever-evolving work environment (Beneke & Human, 2010).

South Africa's Higher Education Institutions (HEIs) must invest in marketing and recruitment strategies to build brand awareness and attract a diverse student body. The Department of Higher Education and Training (DHET, 2013) requires a university operating in the South African context to respond to the country's cultural, economic and social needs and challenges. As universities in South Africa must recruit a diverse student body, the question arises as to how they go about recruiting them. The aim of this study was to determine the factors that influence South African university students' university of choice decisions. The research problem investigated was that South African universities do not know who or what influences a student's choice of university and which factors, students consider important when selecting a university.

Background Literature

The transition of the world economy from a labour and market economy to a knowledge-based economy has globally highlighted the significance of higher education (Dewi, 2018). Society's expectation of the type of impact higher education has on the economic drivers of tomorrow has changed over the years. Along with being knowledge providers, today's universities are also expected to equip students to become socially adjusted individuals, who can critically participate in developing and improving society and a country's economy (Thomas, 2018).

Africa only produces approximately 2% of the world's global knowledge (Teferra, 2019). Africa's universities, especially research-intensive universities, are part of the driving force behind Africa's higher education agenda, which stems from Africa's collective commitment to addressing inequality within the global academy (Habib, 2019). The recruitment of quality students, nationally and internationally, who would contribute to new knowledge creation in South Africa and Africa is of critical importance to the strengthening of Africa's higher education agenda. These students can contribute greatly to the knowledge economy and ensure that the African higher education systems are strengthened by graduating global citizens.

South African higher education and its focus on internationalisation

The International Education Association of South Africa (IEASA) drove the establishment of South African HEIs in the global marketplace (Jooste, 2011). IEASA had to adopt a representative brand and market the higher education landscape and the institutions that form part of this landscape. IEASA did not rely on the rankings and accreditations of certain HEIs within the country, such as the University of Cape Town, Stellenbosch and Wits to "sell" the country's higher education system, but instead focused on building a brand that spoke of the collective key performance areas of South African higher education.

The marketing of HEIs and their products is similar to the marketing of brands, which include many factors, specificities and characteristics, which influence the individual (student) in his/her decision-making process, information searches, purchasing behaviour and in this case, choice of university. Brands (HEIs) have the opportunity to develop a strategy, a marketing message and advertising campaigns that are effective and aligned with their target consumers if they identify and understand the factors that influence their choice (Pride & Ferrell, 2011). The need to recruit local and international students who can increase revenue has changed the recruitment focus to a consumer driven strategy because the HE sector has become more competitive and self- funded (Mosneaga & Agergaard, 2012).

Adams and De Wit (2011) in turn state that due to the competitive environment, universities and other HEIs are no longer only vying for local students, but also for students in other regions and internationally. According to Adams et al. (2011, p. 29) "the global knowledge economy has not only forced higher education to respond to this development but has also stimulated nations and institutions to become important actors and competitors". As with any competitive environment the actors partaking in this competition rely on competitive advantage and key performance areas to set them apart from the rest. Globally, more and more HEIs have been relying on marketing tools and skills to recruit local and international students. This newly identified competitive environment has made relevant stakeholders and institutions reassess the way they market and attract national and international students.

Recruitment strategies in higher education

HEIs use recruitment strategies to recruit students and ultimately persuade them to enrol at their respective institution. A recruitment strategy refers to a strategy designed to recruit students to enrol at a specific HEI (Beneke & Human, 2010). The recruitment of students is important, not only to ensure that an institution stays relevant and operational, but also for revenue purposes.

Universities primarily used a paper-based recruitment strategy to recruit students and ultimately persuade them to enrol at their institution. The recruitment strategies included advertisements, flyers and as technology evolved, university websites later assisted with the recruitment of students. However, this standard and dated approach to recruiting students has become increasingly irrelevant (Fleming, 2017). Recruitment approaches that ignore the factors which influence a student's university of choice decisions will no longer be able to satisfy the information needs and curiosity of an ever-evolving, globally aware individual. It will also not be

able to persuade an indecisive student to apply. Students are culturally diverse and a generalist approach to which factors influence students may not have the required impact.

Focusing specifically on factors which students will consider in recruitment strategies, the following factors have been identified:

- Variety of programmes and quality of programmes;
- Ranking;
- Location;
- Accommodation;
- Fees;
- University brand; and
- Student life (Calitz, Cullen & Jooste, 2019; Maringe, 2006).

However, it is important to note that a one-size fits all approach will not necessarily be advantageous when recruiting local or international students. The factors students consider vary when it comes to recruitment. Different cultures do not deem the same factors as influential. Universities must thus be aware of the factors their specific target markets deem influential and tailor their recruitment strategies accordingly.

HEIs must recognise and understand their customers' expectations of product and service quality and use these expectations in developing and determining the standards of excellence, which guide the academic and operational entities of the university (Maringe, 2006). HEIs will only be able to understand the needs and expectations of their target markets if they invest in and nurture a relationship with their market, specifically students. A mass marketing and recruitment approach would not be suitable. In South Africa, HEIs tend to make use of a mass marketing and recruitment approach instead of a personalised recruitment strategy (Beneke & Human, 2010). This differs greatly from countries such as Australia, the UK and the USA where academic institutions acknowledge the advantages of relationship marketing and implement it in their recruitment strategies (Beneke & Human, 2010).

A targeted approach to recruitment, based on decision-making factors

The term student encompasses three types of segments a university endeavours to recruit, namely school leaver, mature and international (Brown, Varley & Pal, 2009). In order to recruit any of these student types, a university must not only have a focused, clearly articulated brand, but also an informed marketing strategy (Ali-Choudhury, Bennett & Savani, 2009). Similar to a marketing strategy for a company, a university must be clear on its market and the potential students it would like to target. Due to a university's target market being made up of a variety of student market segments, the university must decide which marketing strategy or approach it will invest in to recruit students (Alcaide-Pulido, Alves & Gutiérrez-Villar, 2017).

A university can invest in a mass marketing or one-size-fits-all approach, a target marketing or focused approach or a programme-differentiated marketing approach. Target marketing or segmentation allows a university to target specific growth areas, especially in South African higher education, which has been mandated by its government to recruit a more diverse study

body (Department of Education, 1997). A market can be segmented based on gender, age, lifestyle, culture, geography or income.

An appropriate marketing mix focusing on the needs of the specific target market can then be developed and include a combination of specific information on lecturers, the programmes, the tuition costs, the university itself and its physical facilities, promotion and its processes. The drivers of loyalty, reputation and satisfaction of students should be distinguished and researched, as they will allow higher education marketers to understand what would create increased student value (Helgesen, 2008).

Canada is a good example of segmentation within the higher education sector. The Canadian government identified the higher education sector as a key driver for Canada's economic success. The diversification of the Canadian student body was achieved by recruiting students from China, India, Brazil, the Middle East and North Africa, as these are potential growth markets (Minister of International Trade and Foreign Affairs, 2012). The Canadian government further stated that it would continue to maintain its activities in mature markets from which the country recruits most of its students. The mature markets are France, South Korea, the UK and the USA (Minister of International Trade and Foreign Affairs, 2012).

Social media has also revolutionised student recruitment. According to Constantinides and Stagno (2011), social media marketing's outcomes within the business environment, as well as within the higher education sector are improving communications, increasing brand loyalty and customer engagement. Social media is now a significant factor of influence in the buying behaviour of customers. When incorporated into a university marketing and recruitment plan, it could assist a prospective student to make a more informed decision as to where to study. This can lead to an increase in the number of students enrolling at that specific institution (Constantinides & Stagno, 2011).

The user-friendly nature of social media and online platforms allows universities to disseminate information regularly to prospective students. It further offers universities an opportunity to create online platforms specifically targeting certain markets. As availability and use of online platforms differ, due to the developed nature of the continent and country, the institution's recruitment and marketing plan should incorporate a balanced number of traditional and new recruitment avenues.

Recently, stakeholders and institutions started implementing a market-related marketing strategy to assist them in recruiting students (Jooste, 2011). However, be cautioned that students also form expectations of a university based on their experience of the university's recruitment and admissions process. These expectations will be met, surpassed or not met as the student progresses at the university.

It is not only the international student market that has become competitive, but also the local student market (Maringe, 2006). Research indicates that the factors, which influence local students' (undergraduate or postgraduate) university of choice are varied (Thomas, 2018). The overarching factors which influence university of choice are similar, however the degree of importance varies from country to country and region to region.

The maturity of a student plays a role in the type of factors that influence their choice of university. A study conducted by Maringe (2006) concluded that postgraduate students, specifically Master's degree students, took the following factors into account when choosing their university of choice: reputation with employment of the university/faculty/academic offer; career opportunities; graduate employment rate; quality of teaching staff; specific differential aspects (specialisations, timetables, services, etc.) and cost or value for money.

However, Maniu and Maniu (2014) studied the various research conducted on the factors, which influence a local student's university of choice. The choice factors range from factors related to the influence of others, institutional characteristics, personal factors, factors related to programmes, student life, and future job prospects to economic influences and personal sacrifices. However, the study did find the following factors to be the common choice factors, however, they differed in degree of importance: reputation of the institution; employment opportunities; educational offer; costs; information sources/advertising; infrastructure; location; social life; family (especially parents) and word-of-mouth recommendation from other people.

The impact of the COVID-19 pandemic and online learning

Mohamedbhai (2020) states that the COVID-19 pandemic, will leave no sector in any country in the world unaffected and its impact will be felt for a number of years. The COVID-19 pandemic has come with many uncertainties for the higher education sector and for internationalisation and specifically, student and academic mobility (Tamrat & Teferra, 2020). The short-term implications of this global pandemic include restrictions on international travel by students and staff (Chasi, 2020). The enrolments of international students, who would normally be preparing for an international exchange, have significantly decreased.

HEIs had to quickly find innovative ways to organise, offer and deliver academic material, in response to the global crisis, caused by the COVID-19 pandemic and ever-increasing restrictions (Chasi, 2020). Universities have undergone totally unanticipated changes in the way they operate and in the way they deliver the academic programme. HEIs had to shift to online teaching to ensure students finish their courses on time (Tamrat & Teferra, 2020). Educators have had little time to prepare sufficiently for online education and this has had an impact on the quality of academic programmes (Mohamedbhai, 2020).

Research Methodology

This study followed a positivistic research philosophy and the approach was deductive. The literature study showed that the majority of surveys on universities of choice focused on students studying at European, USA or Australian universities (Canadian Undergraduate Survey Consortium, 2010). The questionnaire was compiled using existing questionnaires from literature, which allowed the survey to be aligned with industry practice in this field. The questionnaire was divided into five sections: Demographics, Parents and Family, Sources of Information and Influence, Factors of Significance and their Importance and Factors of Significance. The questionnaire included Likert Scale statements, multiple choice questions and open-ended questions. In section four, factors of significance, respondents were asked to rate 37 statements on a 5-point Likert scale on level of importance.

The questionnaire was distributed electronically to students who were registered at the NMU Business School and with the NMU International office. The data were captured using the Nelson Mandela University online survey tool, QuestionPro. The research study was conducted using a convenience and snowball sampling technique to address the research question: Which factors influence South African university students' university of choice decisions? A combination of descriptive and inferential statistics, including Exploratory Factor Analysis (EFA) was used to analyse the quantitative data received from 2909 respondents.

Results

The results (Table 1) indicate that 51% (n=1495) were female and 32% (n=921) of the respondents were between the ages of 31 to 40 years. The study can potentially illustrate some bias due to the majority of the respondents being between the ages of 31 to 40 years. It must be noted that the age groups of the respondents are not deemed to be the traditional age of a university student (Guidry, 2018). Due to this, the results of the study can allow universities to better understand the mature student market.

The ages of the respondents can thus also be indicative of the number of individuals who completed their studies (54%, n=1577) and those who were still busy completing their studies (46%, n=1322). Of these individuals, 94% (n=2725) indicated that South Africa was their country of origin, while 6% (n=148) indicated that they were non-South African. The Non-SA respondents included people from Africa, UK, Europe, Asia, Israel, Australia, USA and Canada. Forty-six percent of the respondents were presently completing their studies and 54% had completed their studies.

Table 1: Demographic variables

Gender		Age		Studies	
Female	51% (n=1495)	**18 - 21**	10% (n=299)	**Currently completing**	46% (n=1332)
Male	49% (n=1414)	**22 - 25**	20% (n=591)	**Completed**	54% (n=1577)
Race		**26 - 30**	24% (n=710)	Country of origin	
Asian	1% (n=22)	**31 - 40**	32% (n=921)	**SA**	94% (n=2725)
Black	56% (n=1614)	**41 - 50**	10% (n=287)	**Non-SA**	6% (n=148)
Coloured	14% (n=435)	**51 - 60**	3% (n=83)		
Indian	3% (n=90)	**61 +**	1% (n=18)		
White	26% (n=745)				

The majority of the respondents obtained a degree or an Advanced Diploma (45%), 76% of the respondents were employed and 17% were current students (Table 2).

Table 2: Qualifications and employment status

Qualification		Employment status	
Certificate	73 (2%)	Student	496 (17%)
Diploma	790 (27%)	Student and working part-time	16 (1%)
Degree & Adv-Diploma	1296 (45%)	In-service training, apprentice, articles	117 (4%)
Postgrad Degree	398 (14%)	Not employed	56 (2%)

Other	352 (12%)	Employed	2216 (76%)
		Retired	8 (0.3%)

The factors that influence a student's university of choice decisions are presented in Table 3. Table 3 illustrates the moderate to very important factors that influence a student's decision where to study were *Recommendation of former student* (67%), *University Website* (67%) and *Parents* (68%). The EFA identified 4 factors relating to the influencers on a student's decision regarding a university of choice (Table 3). The factors were Campus visit (items 1.1-1.2), Media (items 2.1-2.5), Family (items 3.1-3.2) and Peers (items 4.1-4.4).

Table 3: Influences on university of choice decision

Influencers on decision regarding university of choice	Factor	Not important		Moderate important		Very important	
		n	%	n	%	n	%
Recommendation of former student	4.1	971	33%	544	19%	1391	48%
University Website	2.2	971	33%	605	21%	1333	46%
Parents	3.1	931	32%	752	26%	1224	42%
Relatives/siblings	3.2	1047	36%	756	26%	1103	38%
Teachers	4.3	1057	36%	700	24%	1151	40%
Career Counsellors	4.2	1108	38%	646	22%	1154	40%
Friends	4.4	1034	36%	842	29%	1033	36%
Campus Visit	1.2	1219	42%	670	23%	1020	35%
Visit to school by Marketing Dept	2.4	1345	46%	680	23%	882	30%
Open Day	1.1	1461	50%	603	21%	843	29%
Social media	2.3	1609	55%	647	22%	652	22%
Advert in newspaper, TV	2.1	1587	55%	721	25%	600	21%

Table 4: Factors considered when choosing a university

Factors considered when choosing a university of choice	Factor	Not important		Moderate important		Very important	
		n	%	n	%	n	%
Quality of academic programmes	2.1	284	10%	381	13%	2244	77%
Variety of academic programmes offered	2.4	392	13%	484	17%	2033	70%
Specific career-related programmes	2.2	384	13%	530	18%	1995	69%
University reputation/ranking	2.3	489	17%	516	18%	1904	65%
University's level of technology	2.8	503	17%	529	18%	1877	65%
Reputation of faculty	2.5	521	18%	548	19%	1840	63%
Tuition fees	4.2	506	17%	673	23%	1730	59%

Job placement rate	2.9	669	23%	608	21%	1632	56%
Scholarships/bursaries available	4.3	777	27%	501	17%	1631	56%
Cost of living	4.1	760	26%	616	21%	1533	53%
Centres of Excellence	2.7	715	25%	759	26%	1435	49%
Level of research activity	2.6	743	26%	769	26%	1397	48%
Closeness to home	3.2	976	34%	537	18%	1396	48%
Availability of accommodation	4.4	1115	38%	482	17%	1312	45%
Opportunity for international work/study abroad	1.3	1038	36%	694	24%	1176	40%
Live at home	3.1	1284	44%	405	14%	1220	42%
Campus security	6.6	1146	39%	612	21%	1151	40%
Location of campuses	6.4	1081	37%	699	24%	1129	39%
Class size	2.10	1021	35%	880	30%	1008	35%
City facilities and activities	1.4	1098	38%	843	29%	968	33%
Size of city	1.6	1141	39%	858	29%	910	31%
University spirit/culture	6.3	1195	41%	774	27%	940	32%
Availability of public transportation	6.5	1332	46%	513	18%	1064	37%
Possibility of studying away from home	3.3	1289	44%	707	24%	912	31%
Alumni Network	1.5	1272	44%	804	28%	833	29%
Size of university	6.2	1353	47%	705	24%	851	29%
Campus social life	6.1	1433	49%	753	26%	723	25%
Opportunities to experience the culture of the country	1.2	1468	50%	684	24%	757	26%
Relatives/parents requirements	5.1	1653	57%	594	20%	662	23%
Ease of obtaining visas	1.1	1615	56%	646	22%	648	22%
Friends attending here	5.2	1638	56%	679	23%	592	20%
Athletic opportunities	6.7	1769	61%	572	20%	568	20%
Family tradition	5.3	2050	70%	489	17%	369	13%

Table 4 indicates the moderate to very important factors considered by the students when deciding where to study. The factors, *quality of academic programmes* (90%), *variety of academic programmes* (87%), *specific-career related programmes* (87%), *university reputation/ranking* (83%), *university's level of technology* (83%), *reputation of faculty* (82%) and *tuition fees* (83%) were regarded as important factors by the respondents. The EFA identified six factors the students considered when choosing a university of choice. The factors were Opportunities (items 1.1-1.7), Academic (items 2.1-2.10), Living environment (items 3.1-3.3), Financial (items 4.1-4.4), Tradition (items (5.1-5.3) and Environment (items 6.1-6.7).

Using inferential statistics, the study further tested if there was a difference in the factors between the national and international students. A Welch's two-sample t-test and Cohen's d test were used. The Welch's two-sample t-test was used as the test does not assume equal sample size or equal variance. The results (Table 5) showed that the alternative hypothesis tested with

the Welch's t-test for Campus visit (t = 4.39; df = 2901; p-value < 0.005), Media (t = 3.16; df = 2903; p-value = 0.002) and Family (t = 3.41; df = 2898; p-value = 0.001) are accepted in that there is a difference in the national and international respondent's perception of the factors influencing the decision to choose a university. The Cohen's d test difference is in the range .20 ≤ d < .50 indicating a *small* practical significance (Table 5). One factor, Living Environment (t = 6.59; df = 2903; p-value < 0.0005), with the Cohen's d test difference of 0.51, indicates a medium practical significance (Table 6) between the national and international students.

Table 5: T-tests on factors for RSA and Non-RSA students

Variable	Origin	n	Mean	S.D	Diff	t	d.f.	p	Cohen's d
Factors influencing decision									
Campus visit	RSA	2723	2,71	1,30	0,44	4,39	2901	**<.0005**	0,34 Small
	Non-RSA	180	2,27	1,28					
Media	RSA	2725	2,59	1,05	0,26	3,16	2903	**,002**	0,24 Small
	Non-RSA	180	2,33	1,08					
Family	RSA	2720	3,03	1,17	0,31	3,41	2898	**,001**	0,26 Small
	Non-RSA	180	2,73	1,20					
Peers	RSA	2725	2,99	1,08	0,15	1,86	2903	,063	0,14 Not Sig
	Non-RSA	180	2,84	1,12					
Factors considered when choosing a university of choice									
Opportunities	RSA	2725	2,71	1,01	-0,16	-2,10	2903	,036	0,16 Not Sig
	Non-RSA	180	2,87	1,06					
Academic	RSA	2725	3,60	0,91	0,05	0,74	2903	,461	0,06 Not Sig
	Non-RSA	180	3,54	1,06					
Living environment	RSA	2725	3,18	1,13	0,57	6,59	2903	**<.0005**	0,51 Medium
	Non-RSA	180	2,60	1,10					
Financial	RSA	2725	3,38	1,08	0,06	0,68	2903	,494	0,05 Not Sig
	Non-RSA	180	3,33	1,17					
Tradition	RSA	2725	2,24	0,97	0,10	1,35	2903	,178	0,10 Not Sig
	Non-RSA	180	2,14	1,09					
Environment	RSA	2725	2,69	0,99	-0,02	-0,20	2903	,844	0,02 Not Sig
	Non-RSA	180	2,70	1,13					

Discussion And Conclusions

Based on the analysis of the data, a South African University of Choice Model (Figure 1) was developed to illustrate the factors which influenced students' in South Africa decision regarding the factors that influenced their decision and the factors that they considered when choosing a university of choice. The model included both factors influencing university of choice decisions as well as factors that students considered when choosing a university.

The factors that influence a student's decision of which university to attend were *Recommendation of former student, University Website* and *Parents*. These findings support the findings of studies conducted (Maringe, 2006). The factors students considered when choosing which university to attend included *quality of academic programmes, variety of academic programmes, specific-career related programmes, university reputation/ranking, university's level of technology, reputation of faculty* and *tuition fees.* These findings support the findings of studies conducted by Calitz et al. (2019). The impact of the COVID-19 pandemic on international student exchange and HEIs' online academic programme offerings are important factors that will impact students' university of choice decisions presently and in the future.
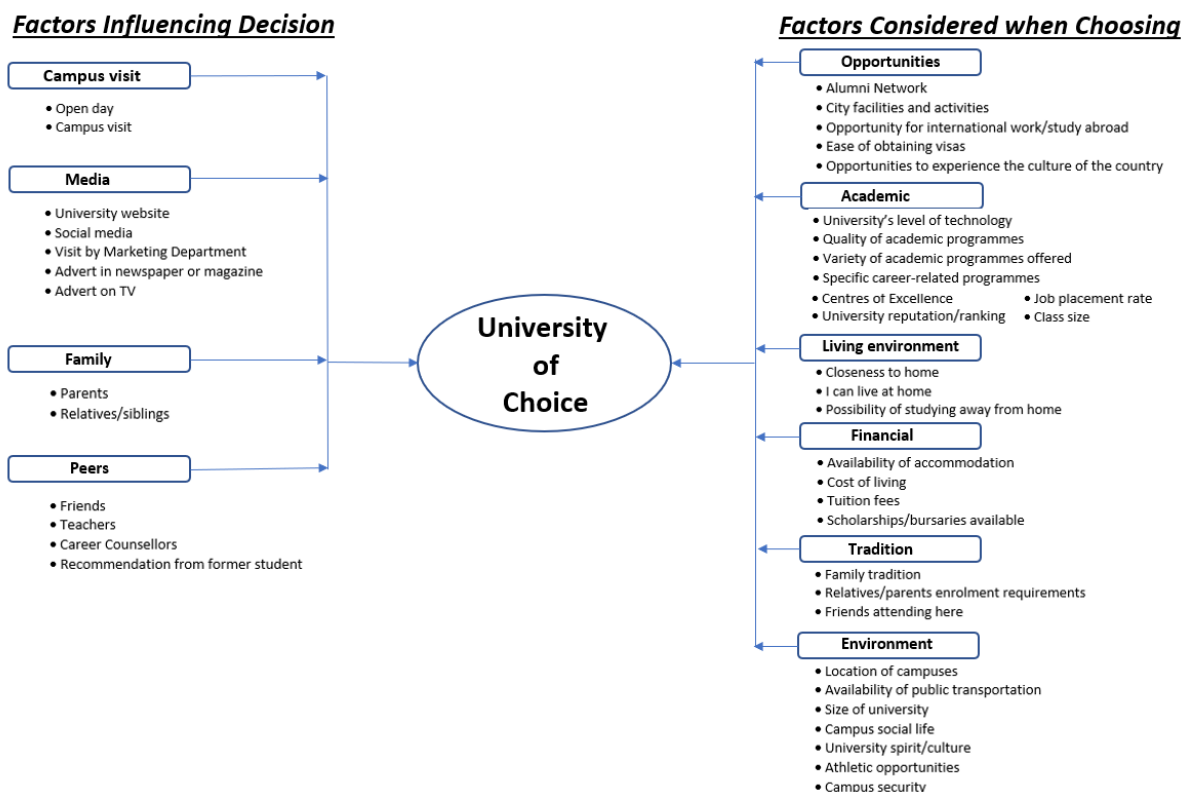
Figure 1: South African Student University of Choice Model.

The t-tests showed a difference between national students and international students for the three factors (Campus visit, Media and family) influencing a student's university of choice decisions. Marketing managers for universities must note that recruiting national and international students requires different marketing strategies. Specific attention needs to be given to the people who influence a student's decision of where to study and the factors that students consider when choosing where to study. The limitations of this study are that the study was conducted at one university and a limited number of international students participated in the study. Research presently conducted includes students studying at universities in the USA, Germany and S.A.

Declaration Of Conflicting Interests

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Student Engagement in the 21st Century Era: Case of Modern College: an Institution of Higher Education

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Abstract

Students learn better and quickly catch up on concepts when they are engaged in class. It therefore never ceases to be the duty of the teacher to create the right classroom environment that is conducive for learning and is characterized by the following; raising students' expectations, developing a good relationship with students, establishing routines, challenging students to participate and encouraging them to take risks. The main objective of this research is to identify key concepts or strategies of engaging students. The sub-objectives are; to establish traits of a curriculum design that engages students, to identify activities and their structures intended to keep students engaged, and to find out how time can be effectively managed in the spirit of engaging students. We therefore hypothesis that strategies do not engage students in learning. In order not to give a broad generalization of research findings, the study focused on pedagogical education because it is based on constructivism, inquiry-based, must show some reflective learning, must be collaborative and integrative. A survey monkey was used to distribute a structured questionnaire to 50 teachers. Results were analyzed using tables, charts as well as diagrams and will be used to discuss the topical issues regarding student engagement. Findings and conclusions will be drawn with extensive guidance from literature and previous research studies. Recommendations will be given to pave the way forward in education.

Keywords: Student Engagement, Higher Education Institutions, 21st Century, Pedagogy, Pedagogical Education

Introduction

The 21st century has seen a rise in the significance of student engagement as a topical issue to researchers, academicians and teachers (Witkowski & Cornell, 2015). Parisio (2011) reiterates that deep learning is enhanced by student engagement which is a fundamental aspect to the learning journey. Teachers of school education, workplace professional development and higher education are particularly focused on strategies to engage learners in activity for learning (Parisio, 2011). Higher education institutions have exhibited massification trends which are associated with opportunities and challenges. Student engagement has been highlighted as one of the challenges associated with massification in higher education institutions, for instance Mangram et al. (2015) in Mohamedbhai (2008) discovered that in Sub-Saharan Africa there is massification in institutions of higher learning. Massification is a term that is used to describe a rapid increase in the number of students attending higher education, a development that was observed in the late 20th century and into the early 21st century (Scott, 1995). This development meant that teachers must come up with strategies to check student understanding, one of them being checking student engagement on a regular basis.

The problem of student passivity in learning situations has inundated teachers and professors at institutions of higher education to search for better ways to assist students to become more active participants in the learning process (Witkowski & Cornell, 2015). Such ways may include teaching techniques that permit students to showcase their understanding and talent which is aligned to cognitive engagement (Himmele & Himmele, 2011).

Harris (2008) posits that there is general agreement that engagement is important in teaching and learning even though there is partial agreement as to what is regarded as engagement. Ramsden (2003) suggests that good teaching has been described as an environment where learners and teachers are equally listening as well as talking. Petros (2006) Pointed out that learning was enhanced when learners were active rather than being passive. Mini lectures paired with active learning activities such as development of concept maps, problem-solving exercises and categorization grid were some of the techniques that made learners active and engaged (Goldberg & Ingram, 2011).

Literature review

Discussions have been known to create a live environment in the classroom since they enable a balance of students' and teachers' voices (Brookfield & Preskill, 2005). Gross and Sonnemann (2017) postulate that it is important for teachers to create a conducive environment in the classroom through developing a good rapport with students, having clear routines, challenging students to participate and take risks. Students who are engaged in class learn more.

Technological tools enable students to gain access to information delivery and have improved learning and teaching environments (Parisio, 2011). For example, Ellis (2009) discovered that teachers at institutions of higher learning think that learning technologies when used as tools enable improved access to information and knowledge building. The use of institutional Moodley is a technology which enables delivery using institutionally controlled learning management systems (LMS). Students can individually interact with their teacher personally. That interaction

is important because some learners are slow and in both face-to-face classroom environments as well as live online virtual such as webinars, video conferences, they usually are not free to ask questions or contribute. For example, (Mirza & Ai-Abdulkareem, 2011) observed that female students in that region were shy to participate in class because of cultural connotations but the same were more participative in distance education.

Wieman and Perkins (2005) carried out a study in which they examined the relationship between traditional instructions and student learning and they suggested better approaches for teaching subjects such as physics in order to avoid cognitive overload for learners through the use of technology and getting learners engaged. Auman (2011) designed a simultaneous-based pedagogy for learners in an Educational Psychology class and discovered that game simulations resulted in increased learner and teacher engagement. Alkandari (2012) investigated students' perceptions about classroom discussions and discovered that learners positively acknowledged that discussions, debates, group work, and presentations were designed to enhance their learning and communication which ended up increasing their engagement as well as motivating them to learn. Factors such as classroom atmosphere, teacher-student interactions were discussed by several researchers as factors that influence engagement (Beran & Violato, 2009; Chiu, 2009; Rocca, 2008; Freeman, Anderman & Jensen, 2007; David, 2004).

Fredericks, Blumenfield and Paris (2004) suggest three types of student engagement: behavioural, cognitive and affective (see Figure 1 and Table 1). Behavioral refers to the character displayed by learners during the execution of the learning task. Cognitive engagement involves the ability to achieve higher-level understanding of materials focusing on Blooms Taxonomy levels of analysis, evaluation and creativity. Affective engagement measures the attitude of learners towards the subject matter as well as interest in the topic under discussion.

Table 1: Cognitive, affective and behavioural dimensions of student learning through edu-larp

Dimension	Student Development
Cognitive	- Active engagement[*] - Critical reasoning - Exercising spontaneity and imagination - Intrinsic motivation[*] - Improved problem-solving skills - Learning multiple skills and knowledge bases simultaneously - Self-efficacy, perceived competence
Affective	- Active engagement[*] - Enhanced awareness of the perspectives - First person identification improving emotional investment - Increased empathy - Increases self-awareness - Intrinsic motivation[*] - Raising social consciousness - Social skills development e.g. Cooperation, debate, negotiation
Behavioral	Active engagement[*]

	● Exercising leadership skills
	● Intrinsic motivation[*]
	● Improving teamwork

Source: (Bowman, 2014)

Bowman (2015) stated that earlier research had suggested that intrinsic motivation and active engagement were present in the three facets of student engagement (Eggen and Kauchak, 2012; Frederecks et al., 2005).
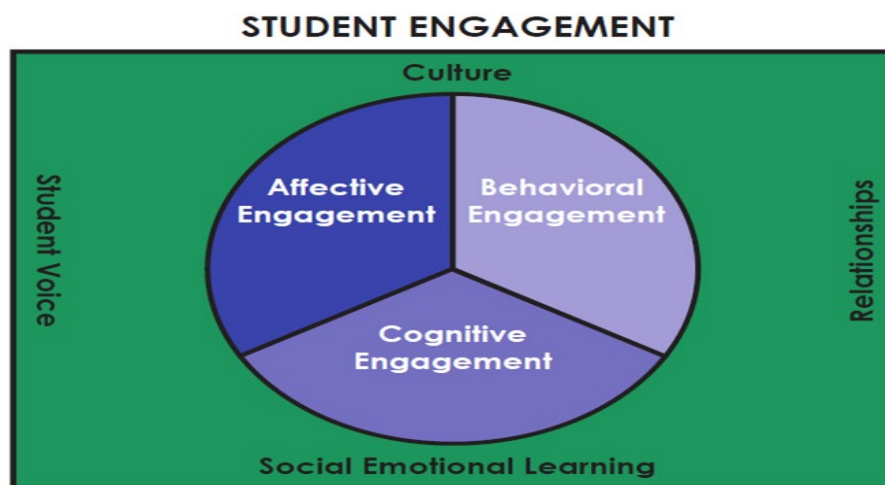
Figure 1: Social and Emotional Learning Model

Social and Emotional Learning (SEL) is the process through which children and adults understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships and make responsible decisions. For instance, a student who comes late in class may display some emotions if he/she feels the teacher will say something negative regarding the lateness. SEL is a process of self-awareness, self-control and interpersonal skills that are vital in the learning process, at work and to succeed in life. For example, people with strong social-emotional skills are better able to cope with everyday challenges and benefit academically, professionally, and socially. They are known to have the ability to shift from effective problem-solving to self-discipline, from impulse control to management. This ability of individuals to shuttle between different environments in the learning process makes it possible for learners to succeed, schools and institutions of higher learning to win, workplaces to benefit and the society to be strengthened.

Burrows (2010) reiterate that researchers in the field of engagement have not reached a consensus on the definition and measurement of student engagement (Appleton et al., 2008; Sharkey, You & Schenoebelen, 2008). Appleton (2006) had earlier proposed a four-part typology (see Figure 2) of student engagement which included academic engagement. The inclusion of academic engagement in the taxonomy is important as time on tasks and work completion have been correlated with student achievement (Appleton et al., 2008; Federicks et al., 2008).

Figure 3 below gives a summary of cognitive engagement displayed by students in the learning process. It is sometimes referred to as Total Participation Technique (TPT) which seeks to differentiate student participation from high order thinking. The relevance of teacher involvement in stimulating student participation is that students will exceed their expectations (Sharpe, 2016). Students learn better in class when they are engaged in the learning process (Gross & Sonnemann, 2017.
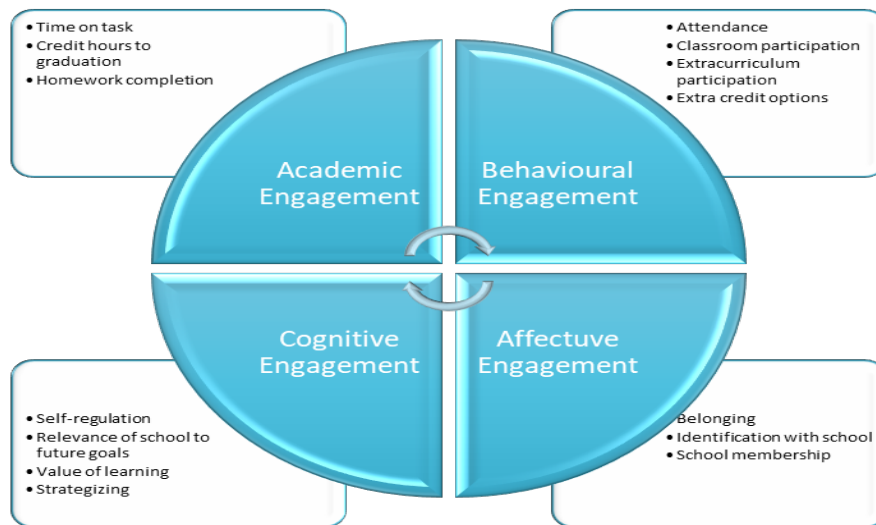
Figure 2: Four-part typology of student engagement (Adapted from Appleton et al, 2006)
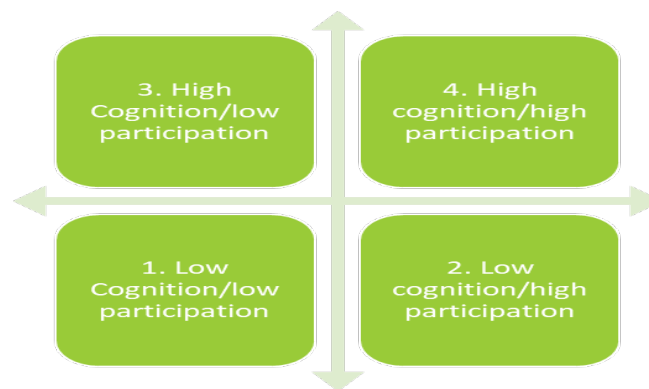
Figure 3: TPT Cognitive Engagement Model (Adopted from Himmele and Himmele, 2011)

Classroom Environment

The Australian Institute for Teaching and School Leadership (2014) noted that a students' expectations, participation and encouragement levels are raised if the classroom environment is good and that environment ensures that no student escapes under the radar.

Methodology

Google forms was used to create a survey monkey which solicited information from teachers at Modern College of Business and Science, Middle East. The study followed a cross-sectional approach because of limitations in time and culture constraints in collecting external data. A structured questionnaire was used which had twenty-six questions divided into two sections; section 'A' soliciting for demographics information and section 'B' enquiring about student engagement. Cronbach alpha was used to test the reliability of the constructs used to measure student engagement.

Results and Discussion

To test for the reliability of the constructs developed in the questionnaire which comprised twenty-six questions, MS Excel was used to generate Cronbach alpha. As solicited from table 2 that the Cronbach alpha was 0.67 for the current study. This figure is a good figure as several researchers have reiterated that a figure of 0.70 is good. The purpose of Cronbach alpha is to test the relevance of construct items because it shows how closely related the items used in studying student engagement are, in other words it shows internal consistency of the constructs.

Table 2: Cronbach's Alpha

Number of items	26
Sum of the item variances	11.69922
Variance of total scores	32.89746
Cronbach	0.670148

The first phase of the study examined the activities employed by teachers to engage students and a summary of the results are reflected in figure 4. Figure 4 revealed that the most popular activities which are intended to engage students in the learning process included debates in which 91% of respondents agreed that it keeps students engaged, followed by discussions in which 88% of the respondents agreed, 78% of the respondents agreed that group work was important to keep learners engaged. Even though these active learning strategies might be used to work for any size of class, there is need to re-thing about their application given the advent of both traditional face-to-face and the virtual learning (Mangram, Haddix, Ochanji and Masingila, 2015). The findings tend to agree with a prior study by Acharya *et al.* (2018) in which students gave comments such as, "this was a great activity which made me look at different situations from real life; this activity showed how little hiccups can turn into big problems." It is apparent that discussions, debates, group tasks keep students engaged in the learning process.
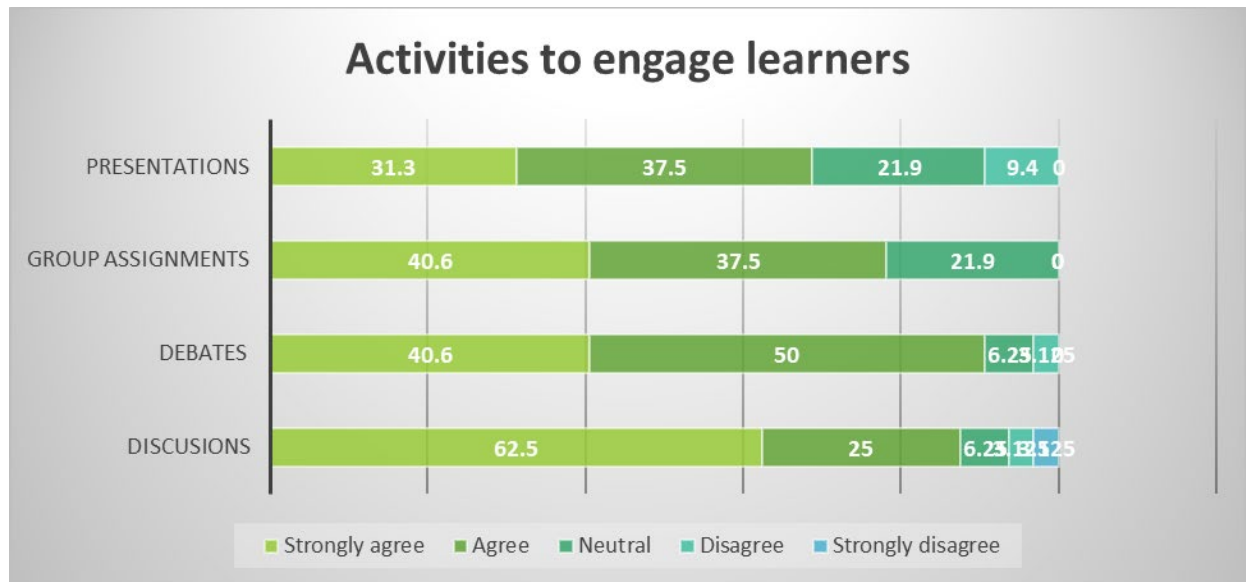
Figure 4:Student Engagement Activities

The second phase in the study was to use the t-test to the null hypothesis. Table 3 shows that the t-statistic of (-2.1828) is less than the critical value of (-1.696) therefore we reject the null hypothesis (H_o) which states that strategies do not engage students and accept the alternative hypothesis (H_a) which states that strategies keep students engaged in learning. The hypothesized mean difference was 4. Table 4 above shows the computed ANOVA test in this research. The F-value (3.669) is greater than the *f-critical* value of (1.587) therefore we reject the null hypothesis (H_o) and accept the alternative hypothesis which states that strategies in learning keep students engaged.

Table 3: Hypothesis Test

t-Test: Two-Sample Assuming Unequal Variances

	4
Mean	3.71875
Variance	0.53125
Observations	32
Hypothesized Mean Difference	4
df	31
t Stat	-2.18282
P(T<=t) one-tail	0.018373
t Critical one-tail	1.695519

P(T<=t) two-tail	0.036746
t Critical two-tail	2.039513

Table 4: One Way Anova Test

	ANOVA						
	Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
SSB	Between Groups	42.19643	20	2.109821	3.668765	1.52221E-07	1.586709
SSW	Within Groups	374.375	651	0.575077			
	Total	416.5714	671				

Recommendations

The study revealed that debates, discussions, group works, and presentations are activities which teachers may use to keep students engaged in the learning process. We, therefore, proffer the following recommendations; first, teachers must continuously use debates, discussions, presentations and group work as activities which keep students engaged. Secondly, we recommend that future studies separate engagement activities into threes, online learning, face-to-face and blended learning engagement activities.

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Innovative Assessment Techniques, Strategies, Tools and Technologies

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Abstract

Higher Education Institutions (HEI) have a mandate of imparting knowledge to learners for the purpose of equipping them with skills to survive in the 21st century. But before the survival skills are fully attained, there must be some form of assessment that takes place from the date a learner enrolls at an institution of higher learning to the day that a certain qualification is awarded. Several definitions of assessment have been proffered by researchers; 'assessment is evidence of performance (William & Black 1996).' Hattie and Timberley (2007) define assessment as 'an activity used to assess students' level of proficiency.' It involves making decisions about what is relevant evidence for particular purposes, how to collect the evidence, how to interpret it and how to communicate it to intended users (Harlen, 2005). Black and William (1998) redefined formative assessment by stressing that assessment is only formative when it is an integral part of learning and teaching aimed at providing teachers with information to adjust instructions to fulfill students' learning needs. The learning experience is enhanced by an effective and efficient assessment approach, in fact, assessment approaches shape the learners' understanding of the curriculum being studied in addition to determining their ability to proceed. Higher education institutions have a budget specifically for assessment, be it formative or summative, even though in most cases it is the summative budget which is visible. Part of the budget includes time and resources of which the teacher makes greater contributions in that he/she makes decisions such as what to include in an assessment activity, how it should be done and when.

Assessment for learners has of late attracted attention of researchers, educators and has become a buzzword in the field of education (Sardareh & Saad, 2013). Assessment is instrumental for both teachers and learners in that it improves learning by providing timely feedback making it possible for the teacher to adjust and improve his/her approach while at the same time affording the learner the opportunity to align his/her thinking, understanding and application of concepts to what is really required and expected. Assessment for learning (AfL) is not about certifying learning, but rather concentrates on improving learning (Sardareh & Saad, 2013). When properly used, assessment helps teachers fulfill other components of learning such as critical thinking skills, and personal abilities, lifelong learning and mutual understanding (Bennett, 2011).

Keywords: Innovative Assessment, Assessment Techniques, Assessment Strategies, Assessment Tools, Assessment Technologies

Introduction

Higher Education Institutions (HEI) have a mandate of imparting knowledge to learners for the purpose of equipping them with skills to survive in the 21st century. But before the survival skills are fully attained, there must be some form of assessment that takes place from the date a learner enrolls at an institution of higher learning to the day that a certain qualification is awarded. Several definitions of assessment have been proffered by researchers; 'assessment is evidence of performance (William & Black 1996).' Hattie and Timberley (2007) define assessment as 'an activity used to assess students' level of proficiency.' It involves making decisions about what is relevant evidence for particular purposes, how to collect the evidence, how to interpret it and how to communicate it to intended users (Harlen, 2005). Black and William (1998) redefined formative assessment by stressing that assessment is only formative when it is an integral part of learning and teaching aimed at providing teachers with information to adjust instructions to fulfill students' learning needs. The learning experience is enhanced by an effective and efficient assessment approach, in fact, assessment approaches shape the learners' understanding of the curriculum being studied in addition to determining their ability to proceed. Higher education institutions have a budget specifically for assessment, be it formative or summative, even though in most cases it is the summative budget which is visible. Part of the budget includes time and resources of which the teacher makes greater contributions in that he/she makes decisions such as what to include in an assessment activity, how it should be done and when.

Assessment for learners has of late attracted attention of researchers, educators and has become a buzzword in the field of education (Sardareh & Saad, 2013). Assessment is instrumental for both teachers and learners in that it improves learning by providing timely feedback making it possible for the teacher to adjust and improve his/her approach while at the same time affording the learner the opportunity to align his/her thinking, understanding and application of concepts to what is really required and expected. Assessment for learning (AfL) is not about certifying learning, but rather concentrates on improving learning (Sardareh & Saad, 2013). When properly used, assessment helps teachers fulfill other components of learning such as critical thinking skills, and personal abilities, lifelong learning and mutual understanding (Bennett, 2011).

Literature Review

Effective assessment and feedback (Assessment approaches)

Four learning perspectives have been suggested by Jisc Library Hub and must not be observed as discordant but require a hybrid of several of them and not just one to achieve the required results that will benefit the learners. Table 1 below gives a summary of these learning perspectives.

The Associative Perspective

This perspective puts emphasis on the fact that learning is about acquiring competencies as a result of linking different concepts to come up with competent skills. Assessment might involve testing knowledge and skills on small-scale to more complicated assignments with the objective of establishing whether those concepts have been mastered. Projects or work-related tasks may be given such as making it mandatory for learners to go on industrial attachment for a reasonable

period or those who are already employed, getting attached under a relevant department to which their degree or any other qualification is aligned (Jisc Library Hub).

Table 1: Perspectives on learning and approaches to assessment and feedback

Perspective on learning	Assumption	Assessment	Feedback
Associative	***Learning as acquiring competence*** ● Learners acquire knowledge by building associations between different concepts ● Learners gain skills by building progressively complex actions from component skills	Concept and competencies frequently assessed at micro-level and in combination through macro-level tasks	● Expert feedback focusing on weaknesses in skills and conceptual understanding ● Interactive environments for knowledge and skills acquisition
Constructive	***Learning as achieving understanding*** ● Learners actively construct ideas by building and testing hypothesis	Assessment by means of experimentation, discovery and enquiry-based tasks.	● Self-generated assessment arising from reflection and self-assessment. ● Interactive discovery environments with opportunities for self-testing.
Social constructive	***Learning as achieving understanding*** ● Learners actively construct new ideas through collaborative activities and dialog	● Collaborative and cooperative tasks involving shared expression of ideas. ● Participation by learners in the design of assessment tasks.	● Peer feedback arising from collaborative activities and dialogue. ● Interactive environments that support sharing and peer feedback.
Situative perspective	***Learning as social practice*** ● Learners develop their identities through specific communities of practice.	● Holistic assessment in authentic or simulated professional contexts. ● Participation in social practices of inquiry and assessment.	● Socially produced feedback from multiple sources ● Feedback derived from authentic real-life tasks. ● Interactive environments that stimulate

			professional practices.

Adopted from JISC Library Hub

The Constructive Perspective

The Constructive perspective proposes that learners are supposed to be actively constructing their own understanding of concepts taught. Assessment must focus on the extent to which learners can structure and restructure material for different reasons having no assistance from other learners, more of inquiry-based tasks. It is vital to give learners feedback because it helps them become self-directed. The approach requires that learners reflect, self-assess and generate genuine feedback on their own learning. Teachers must be fair to learners by providing genuine feedback, for instance feedback must not be based on favoritism or some fixing. A learner who is used to cheating will even continue in real life and cheat all the way and on the contrary a brilliant learner who is unjustly punished might be discouraged the rest of his/her life and consider life to be unfair (Jisc Library Hub).

The Social Constructive Perspective

The social construct demands the input of society in assessing a learner and includes dialogue and collaboration which are regarded as pertinent to building understanding. Assessment in this approach involves group tasks and assignment, "these require working together with others, high degree of communication and prompt feedback with the group." This kind of assessment prepares a learner to real life situations where s/he will be required to work with others and collaborate and in some instances, individual contributions to the group project might be assessed. The perspective dictates that feedback is not provided only by the teacher but must come from other group members and should be rich and wide-ranging (Jisc Library Hub).

The Situative Perspective

The perspective observes learning as emanating from participation in communities of practice. During their learning period, learners participate in many learning communities which prepares them to become members of professional settings, for instance those who are exposed to judiciary systems in their environment they begin to think and act like lawyers. It is regarded as like the social constructive perspective but puts more emphasis on identity formation. Assessment tasks would be authentic and modelled on what happens in professional practice. Feedback involves disciplinary experts as well as those in important roles and professions (Jisc Library Hub).

There has been an increased interest from the educational assessment community in assessment practices on learners as well as the assessment environment (Alkharusi, 2008). For example, many educators have claimed that assessment-related activities used in the classroom convey important information about what is valued and as a result have an influence on students' achievement goals (Ames, 1992; Harlen & Crick, 2003). Goals set for assessment are either performance whose aim is to show outward competence of concepts taught or mastery whose aim is to assess competency development (Ames, 1992; Dweck, 1986; Nicholls, 1984).

Normative and Summative Assessment

Formative and summative assessments are essential terms to understand educational assessment (Sardareh & Saad, 2013). Formative assessment (see table 2 below) put more emphasis on the importance of providing students with feedback to help improve their learning (Black & Wiliam, 004; Sadler, 1989; Shavelson, 2006). Formative assessment is vital in learning as it has been discovered to contribute to unlearning and relearning from a longitudinal study carried out over a period of nine years in more than 250 articles extracted from over 160 Journals (Black & William, 1998).

Table 2: Rubric for formative assessment of a written assignment

	Rubrics	**Points**			
		Unacceptable 0-25% of item mark	**Acceptable 50% of item mark**	**Very Good - Exemplary 75-100% of item mark**	**Mark**
1	Introduction	None	Introduced but lacks clarity on concept examined	Concept has been clearly highlighted including what the work will achieve	2
2	Definition of key terms in the question	No definitions given	Partial definitions given or some not in the questions	Key terms have been identified and defined fully.	2
3	Body: Identification of concept/issue and its application	Does not give an accurate explanation of the relevant concept assessed	Gives a satisfactory explanation of the concept with minor errors or omissions	Gives give an accurate, adequate/sufficient explanation of concept relevant question	18
4	In-text citation	Lack in-text citation but statements suggest they were copied	Acknowledgement of sources but in some cases evidence missing or no evidence in reference section	Clear evidence of in-text citation as well as clear evidence in the reference section.	1
5	Conclusion	Analysis/concept is poorly concluded	No adequate conclusion reached	Very clear conclusion given including position taken if the question required critical analysis, examination or discussion	1

| 6 | Referencing | None | Partial with some citations missing in reference section | Clear indication that citations were referenced | 1 |
| Total | | | | | 25 marks |

Authors' initiative

Table 2 is an example of rubrics which may be used for formative assessment of learners. It is a structured assessment with very clear marks allocation for all the components making up the whole. An astute student will not be confused when given such rubrics, for instance the introduction part expects learners to explain to the examiner the purpose of the write-up and its topic. The definition part expects learners to define only key terms in a particular question which reinforces their understanding of a concept.

Table 3: Rubric for mark allocation in special subject which requires real application like Law

	Rubrics	Points			
		Unacceptable 0-4	Acceptable 5-6	Very Good - Exemplary 7-10	Percentage
1	Identification of concept/issue	Concept not addressed or are addressed inappropriately	Addresses most of the issues but overlooks a few minor ones	Addresses all major issues and most of the minor ones as well	10%
2	Identification of the source of the law on each issue (The name of the case or the section in the statute on each issue)	Sources are not identified or are identified inappropriately	Overlooks or inappropriately identifies a few of the major sources and some of the minor sources	Addresses all the major sources and most of the minor ones	10%
3	Accurate explanation of the relevant law on each issue	Does not give an accurate explanation of the relevant law on each issue	Gives a satisfactory explanation of the relevant law on each issue with minor errors or omissions	Gives give an accurate explanation of most of the relevant law on each issue	40%

4	Application of the relevant law to each issue	Does not present a well-argued application	Presents coherent application but does not address some significant matters	Presents and discusses very thoroughly a coherent application of the law to most issues	30%
5	Presentation and organisation of work in a logical manner	Analysis is poorly organised and does not flow effectively	Analysis is reasonably well organised, and flow is adequate	Analysis is very well organised, and flow is effective	10%
Total					**100%**

Authors' initiative

Table 3 shows a different approach to assessment for subjects which are usually practical such as law, media or art. These subjects require acumen and creativity from the learners which will be judged by the display of the artifact or the way a learner handles a practical issue. For instance, in law if this is used the rubrics will be ranging from unacceptable to very good or extremely good. The rubrics in law may be identification of the issue, identification of the source of law, accurate explanation of the relevant law and organization as well as good presentation of the facts. Summative assessment (see table 3 above) centers on students' level of achievement (Bloom, Hastings, & Madaus, 1971; Sadler, 1989; Shavelson, 2006).

Final Rubrics for Formative and Summative Assessment: Table 4 below gives a summary of the rubrics which may be used for summative assessment of learners. This may or may not include the formative assessment but what is important is that it must be consistent and applied universally across the institution, country or region.

Table 4: Lexicon for Design Projects

75%+ First Class (1)	60-69% Upper Second Class (2.1)	50-59% Lower Second Class (2.2)	40-49% Third Class (3)	Less than 40% Fail
Quantitative **Throughout. Integrated. Cohesive. Consistent.** Qualitative: Creative. Analytical. Critical. Breadth. Depth. Relevant. Evaluative. Wide-ranging. Salient. Inquiring. Informed. Discovery. Clarity. Control. Concept. Precision. Accuracy. Elegance. Secure Identity. Advanced. Appropriate. Poetic. Functional. Rigorous. Articulate. Sustained. Applied. Very well crafted. Refined. Very well edited. Ambitious. Engaging.	Quantitative **Most aspects....** Qualitative: Creative. Analytical. Critical. Breadth. Depth. Relevant. Evaluative. Wide-ranging. Salient. Inquiring. Informed. Discovery. Clarity. Control. Ideas. Precision. Accuracy. Elegance. Sense of Identity. Advanced. Appropriate. Poetic. Functional. Rigorous. Articulate. Sustained. Well edited. Engaging.	Quantitative **Partial. Evidence of some........** Qualitative (in parts): Analytical. Informed. Breadth. Salient. Discovery. Applied. Inconsistencies. Emerging identity.	Quantitative **Begins to ...... may be completed but lacks** Qualitative (lacks): Breadth. Depth. Understanding. Analysis. Evidence. Clarity. Development. Rigor. Cohesion. Resolution. Functional Rigor. Inconsistent. May lack precision. Confidence. Control.	Quantitative **Limited or no evidence of.....** Qualitative: The work submitted fails to...
Fluent	Confident	Competent	Basic	Limited

Source: Andrews, Brown and Mesher (2018)

Discussion

The current study has employed a cross-sectional review of literature to review the two traditional approaches to assessment namely formative and summative and its impact on HEI and learners. (Lofgren, Lofgren & Lindberg, 2019) indicate that several governments across the globe had introduced the assessment reforms. Most of the publications that were identified throughout the literature review highlighted the popularity of these approaches in high school education which leaves a gap on higher education for instance, (Kyaruzi, Strijibos, Ufer, & Brown,

2019) state that students' perceptions of quality of teacher feedback and perceived scaffolding positively predicted their use of the feedback on a particular subject. But questions arise as to whether the same observation applies to higher education learners. A study by (Guskey, & Link, 2018) revealed that teachers used several factors to assess students which they applied differently for instance, formative assessment was given more weight in primary education than in secondary education. A concept known as 'Sawtooth Effect" was investigated by (Cuff, Meadows, & Black, 2018) in England showed that there was a drop in student performance after the initial reforms but improvement in performance was experienced later. Therefore, the different types of assessments proved to offer benefits.

Conclusion

The aim of the study was to establish innovative strategies, techniques, tools and technologies which are available for use in institutions of higher education. Through literature review, the study revealed that several modern strategies, tools, techniques and technologies are available for use in assessing learners. However the study found out that these techniques, technologies, tools and strategies are mostly used in high school setups more than in higher education institutions.

Recommendations

The researchers recommend that continuous use of both formative and summative assessment in HEIs is important embracing the framework suggested by Blooms (1965). It is also recommended that assessment of learners must have clarity in the form of written rubrics, templates and any tools which must be made available to students/learners from the onset so that the process becomes transparent. The study further recommends that technologies used by HEIs may be online, face-to-face or a combination of the two. However, care must be taken when using online technologies to limit assessment options to technologies which are whole owned and controlled by individual institutions because those which are not controlled can pose dangers and difficulties.

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The use of online learning as a functional tool in Higher Education during the COVID-19 pandemic: An analysis of best practice cases

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Abstract

The current COVID pandemic has given rise to the need for the Innovative adaptation of technology in education as a means of sustaining educational progress whilst maintaining the health prerequisites for students. Online learning has been prevalent in many countries but is still not advanced in developing countries such as South Africa due mainly to access constraints which are rooted in systemic inequality which needs fundamental redress if the digital divide is to be overcome. This paper explores online learning trajectories, platforms and applications that have proven to be successful. This study focuses methodologically on existing cases found in the literature and comparisons with South Africa are made in the qualitative analysis. This paper aims at providing guidelines and recommendations to South African educational institutions with regard to a way forward during the era of physical distancing.

Keywords: Adaptation, Inequality, Education, Innovation , Integration , Online learning

Introduction

The current pandemic of COVID-19 has led to national lockdowns of many countries globally. This has resulted in the need for the transformation and adaptation of teaching and learning approaches where physical distancing has become the norm so as to ensure that the academic year is not lost and that there is still adequate means to maintain academic delivery and performance. Due to the current pandemic of COVID-19, higher education institutions have opted to continue functioning by conducting teaching and learning activities online. This paper investigates the practices adopted internationally in this regard and relates it to prospects of the

development and adoptability by South African higher education institutions. This will be achieved through the review of literature surrounding university education during the pandemic as "gaining insights about these experiences is important to ensure the quality of online teaching as colleges and universities continue expanding e-learning programs" (Perrotta & Bohan, 2020). An important point made in this paper is that online education can not succeed without the provision of basic services being in place for South Africa's poor. In an unequal country like South Africa with high levels of unemployment and poverty opting for first world solutions without deferring to the stark realities could actually exacerbate the problems of social inequality. Whilst access to the internet and all necessary support are critical for online learning so is access to food and jobs. In a very difficult environment challenges facing both government and university leaders are acute and require participative democratic solutions apart from just technocratic ones.

Background to the Pandemic in SA

The South African President declared a National State of Disaster due to the COVID-19 pandemic in March 2020. The US Centres for Disease Control and Prevention recommended the avoidance of gatherings of more than 10 people. As a result, in-person academic activities, including teaching conferences, morbidity and mortality conferences, and simulation labs needed to be avoided (Chick et al., 2020), as these would result in face to face interaction . In light of rising concern about the COVID-19 pandemic, the mortality rate and the numbers requiring medical attention, a growing number of universities across the world have either postponed or cancelled all campus events such as workshops, conferences, sports, and other activities(Sahu, 2020).

Objective of the research

This initiative was undertaken to establish an overview of how universities internationally have dealt with the pandemic from a teaching and learning point of view and what lessons may be drawn from the practices embarked upon.

Desktop analysis

This paper is based on desktop research and an analysis of secondary data. This was collected from existing research reports, journal articles, newspaper reports and other publications, many of them found on the internet. This approach also ensured safety as "social distancing" was maintained during the study.

Impact of the Pandemic on Higher Education in South Africa

The Coronavirus 2019 (COVID-19) pandemic has had such an extensive impact on the global higher education sector(Crawford, Butler-Henderson, Rudolph, Glowatz, & et al., 2020). As a strategy to slow down its spread, countries all around the world adopted strict protocols such as complete or partial lockdowns, social distancing regulations, and curfews (Bozkurt et al., 2020).

The pandemic resulted in face to face learning and teaching in South Africa and the rest of the world coming to a standstill due to the lockdown necessitated by COVID-19 (Mhlanga & Moloi, 2020).

When the National State of Disaster was declared in South Africa due to the COVID-19 pandemic, disaster centres were supposed to play a coordination role. However, disaster centres that were set up by the South African government prior to the pandemic that would function as a means of assistance , guidance and support to the country should a disaster or pandemic arise were overlooked (Takalani, Ravhuhali, & Mapotso, 2020). This left the Minister of Higher Education, Science and Technology with no option but to let universities determine their own responses, mitigation and recovery plans in response to the disaster caused by COVID-19 pandemic (Takalani et al., 2020).

When the analysis of the impact of the pandemic on higher education in South Africa is made , it is inevitable to recognize that South Africa is a 3rd world contrary and is still affected by the gap of inequality , the digital divide and lack of access to technology . Although South Africa is able to learn for the successful trends and practices of cases and examples of strategies used by higher education institutions around the world , one has to consider that South Africa would have to react to the impact of the pandemic in higher education based on its current resources and facilities . As Black indicates "Opening the doors of quality learning has remained elusive for the vast majority of school-attending children in South Africa since the dawn of democracy in 1994 and opportunities for meaningful education on any terms remains slim for those on the wrong end of material, linguistic and spatial inequities, all of which closely align with race through sedimented apartheid balkanisation and enduring specialities(Sara Black, 2020).

Online teaching and learning

During this rapidly evolving crisis, a great deal of flexibility will be required from both learners and educators, and learning methods that are not well-studied may be necessary(Chick et al., 2020).

There has been the promotion of flexible ways of studying and working so as to hinder the rapid spread of the virus across all continents (Vlachopoulos, 2020).Learning activity was conducted via remote and online learning in most of the South African Universities.

Several universities suspended the semester-end and final examinations, whereas continuous assessment will go on along with the online classes(Sahu, 2020).The suspension of formal examinations was welcomed by both the university leaders and the students as there was agreement that traditional, formal traditional examinations noting tertiary level registration numbers would not be possible given the prescripts of the Disaster Management Act.

In terms of educational processes, the catastrophic interruption of education signifies the importance of innovation in the delivery of educational services and highlights issues that should

be taken into consideration such as using alternative assessment and evaluation methods. This raises new concerns about surveillance, ethics, and data privacy resulting from nearly exclusive dependency on online solutions (Bozkurt et al., 2020).

Challenges with using information technology are widespread . Barriers such as inadequate infrastructure to support effective use of computers and tablets were challenges experienced by users, along with low confidence and low levels of satisfaction when learning online because their internet and computer skills were weak (Jowsey, Foster, Cooper-Ioelu, & Jacobs, 2020). In addition ill-disciplined students who are unable to programme their own behaviour are bound to experience negative circumstances. If students are self-disciplined, then virtual classroom education can improve student learning outcomes. Ng & Or (2020). The challenge for learning programmes at all levels (primary through tertiary) is now to enable individuals to thrive in a world that needs more imaginative, creative, innovative, and interculturally-competent talent, not generic workers that can fill seats at an office or factory (Moravec, 2020).

The results of survey research by Ana et al with Malaysian and Indonesian students showed that students know e-learning as a distance learning system in dealing with the current pandemic coronavirus, 51% expressed agreement related to e learning preparation, 38% stated neutral in e-learning planning and 68% stated neutral in evaluating the implementation of e-learning (Ana et al., 2020). Student assessment and good perception about e-learning play a big role in the implementation of learning with e-learning. E-learning has a positive impact and has become an alternative learning process for lecturers and students. Good preparation is needed in implementing e-learning so that e-learning activities can be carried out effectively. Interaction can be developed and limited conditions through face-to-face meetings can be answered through e-learning activities. (Ana et al.,2020)

A study by Alvarez (2020) identified four themes related to the challenges of online learning viz.: poor to no internet access, financial constraints, lack of technological devices, and affective or emotional support. Interestingly, findings showed that learning remotely in these trying times is challenging because aside from the existing problems on access and affordability, the emerging concerns on financial stability and affective support contributed to interrupted learning engagement(Alvarez Jr, 2020). When this study is compared to South African universities it may be said that similar themes apply. Poor access to the internet and lack of infrastructure for students in rural areas is of serious concern. Students face financial constraints in terms of data and equipment.

The South African government has made provision for mobile networks to provide a restricted amount of mobile data to students on a monthly basis and University websites were also converted to zero rated links so that minimal data would be required for students to access material and information . However, this has not solved the challenge as students in rural areas do not have internet signals and equipment.

Means, Bakia and Murphy (2014) described several key dimensions for effective online instruction. These dimensions encompassed:
• modality – online or blended modes;
• pacing – self-paced or class-paced;
student instructor ratio – this could vary from face-to-face to extremely large classes;
• pedagogy – could be expository or move towards collaborative and/or exploratory;
• instructor/teacher role – monitors progress and motivates students, and/or students become knowledge builders;
• student role – move from listen or read to explore, collaborate, and complete assignments;
• communication – synchronous and/or asynchronous;
• role of assessment – determine if students are ready, identify students at risk of failure, provide information, and input grades/marks; and
• sources of feedback – automated, from the teacher, and/or from peers.

Fournier et al.'s (2016) Inclusive Leadership Framework (ILF) provided a necessary structural framework to ground and guide ethical decision making even within the extraordinary challenges presented by a pandemic. "Indeed, even though this pandemic
turbulence presented considerable and unanticipated challenges… we found the ILF to be valuable by helping us to remain focused on: 1) promoting the learning of all students; 2) implementing successful inclusion and differentiation strategies (*pedagogical knowledge*); 3) innovating our pedagogies and assessment practices (*inclusion knowledge*); and 4) maintaining respectful collaboration and engagement with parents, students, and the educator community (*communication*), which were all navigated through our *professionalism* demonstrated by our core beliefs in an *ethic of care* and *appreciation of diversity*."

Inclusive leaders have the following characteristics:
• hold fast the belief that all students can learn;
• value student voice and understand that students' motivation increases when they have a input into their learning, assessment tasks, and their Individual Education Programme/Plans (IEP);
• ensure that all students are integrated as valued members within their school community;
• actively promote teacher/paraprofessional engagement with professional development and provide opportunities for their growth;
• appreciate the importance of a broad range of diversity in learning experiences and authentic assessments;
• promote the implementation of creative and alternative activities and remove barriers to innovation; and
• foster an atmosphere of collaboration, based upon trust, respect, and courtesy, with parents, advocates, and staff members, avoiding patronisation and remaining ever mindful of the power differentials that exist. (based upon Fournier et al. 2016). Inclusive leaders are an essential component in dealing not just with the pandemic but in building socially cohesive groups.

The Department of Higher Education and Training's response

The Department of Higher Education and Training (DHET) is responsible for tertiary education and vocational training in South Africa. There was no clear statement issued to universities by either the Department of Higher Education, the Department of Science and Technology or the Department of Cooperative Governance and Traditional Affairs on what universities should do during the national state of disaster(Takalani et al., 2020). As there was no central co-ordination and administration of the disaster response, universities reacted differently in managing the national state of disaster caused by COVID-19 pandemic (Takalani et al., 2020). Lack of communication and inconsistent information from educational institutions and ministries of education have added to the anxiety (Bozkurt et al., 2020).

Remote learning has become the main method of academic delivery in South African universities. Remote learning is defined by Hodges et al (2020) as the educational practices, during the COVID-19 pandemic, denoted with different terms in different countries (e.g., distance education, e-learning, online education, home-schooling, etc.) This current teaching situation is described as being temporary in nature, with the goal to provide instruction in a reliable way and an easy to establish approach in a crisis situation. In such a critical time, there has been a drastic change in how teaching and learning happens while learners are physically out of schools and separated from their teachers and co-learners. The educational practices during the COVID-19 pandemic are denoted by the use of different terms in different countries (e.g., distance education, e-learning, online education, home-schooling, etc.) (Bozkurt et al., 2020). Hodges et al.'s suggested Emergency Remote Teaching offered a delivery method that is specific to the ever-changing needs faced in a crisis, such as the COVID-19 pandemic. Since universities are educational and research institutions, they are necessarily involved in the cycle of disaster because they are expected to contribute broadly to their communities(Takalani et al., 2020).

Television and radio have been used to good effect in the delivery of lessons to learners in primary and secondary education. Mhlanga and Moloi (2020) reported that SABC, DSTV and Etv were used for the one-way delivery of lessons using Tv, radio and desktop platforms. Although these offline approaches did not allow for interaction educational lessons as per the syllabus could continue and be followed through by email and telephonic communications.

On-Line and remote Learning at South African Higher Education Institutions'

South Africa is a developing nation and as a result there are many challenges that exist such as that of accessibility of online learning for the poor. Despite the popularity of online courses and degree offerings in higher education, limited research has been conducted on the unique challenges and opportunities online faculty face (Perrotta & Bohan, 2020).

In South Africa, during the lockdown, a variety of 4IR tools were used from primary education to higher and tertiary education where educational activities switched to remote (online) learning

(Mhlanga & Moloi, 2020). In SA, Moving online was only an option for a small minority of fortified public primary and secondary schools,4 despite only 11% of South African homes having an internet connection into the home, and the vast majority of people relying on (expensive) mobile data solutions for access (Stats SA 2016). Once again, access to devices, time and space, data and support is deeply classed and raced (Black,2020).

The education crises prior to and during the COVID-19 moment were analysed across two countries, namely, South Africa and the United States, to suggest that prevailing responses to these crises will further exacerbate inequalities if left unchecked (Sara Black, 2020). New technologies in education are too often used to reinforce old practices rather than enabling the emergence of new practices and means of knowledge production. We use technologies to help perfect what we have already been doing(Moravec, 2020). As we all learn to work more remotely, undertake meetings electronically through necessity, the ability to use such information technology (IT) methods competently is bound to increase (Chiodini, 2020).

However the use of online tools and online learning did exist in South Africa prior to the COVID-19 pandemic . Online software such as Moodle was implemented at all higher education institutions in South Africa prior to the pandemic as an additional tool of teaching and education at institutions. The use of Learning Management Systems (LMS) such as blackboard, eCollege, Moodle and others are being used throughout the educational sector. Some even incorporate such technology to measure teaching effectiveness and student performance. Furthermore, social websites, like Facebook.com, have become so popular that 85% to 99% of college students use it in one form or another(Jeljeli, Alnaji, & Khazam, 2018).The pandemic has therefore forced the content into being accepted as the primary source of distance learning and no longer an additional tool of education

An analysis of On-Line Learning strategies

The pandemic has affected almost every country on earth and has significantly changed the approach that universities have adopted to educational service delivery. The mental health of students during this time has also become a universal concern (Sahu,2020). Shifting from face to face to online learning requires a new mindset for many. Both staff and students who are not techno savvy have difficulty in coping with the change even though it is not a completely new approach. Online assessment and evaluation of courses designed for face to face delivery also poses a challenge. International students living in isolation may have difficulty coping, this then contributing to the aforementioned stresses that they already face as a result of the lockdown. Therefore, universities are obliged to take proactive measures to support their students, something requiring universities to spend on new, improved and expanded counselling services. As Al-Raabiah (2020) points out universities should provide mental health support by updating health guidelines with regard to managing stress during the various stages of lockdown.

UJ, UCT and UP were the first SA institutions to announce to their students that they would be conducting online learning and teaching in the second semester of 2020 in order to comply with social distancing regulations and to salvage what was left of a fractured academic year. Many other universities followed suit and published study guides, worksheets, notes and learning materials on their websites (Mhlanga and Moloi, 2020).

According to Barr and Miller (2013), some instructors "find it challenging to adjust [to a] new pedagogical form." It stands to reason that ongoing training is required for academic staff in order for them to be fully equipped and confident to participate in the new forms of engagement.

Challenges that Perrotta and Bohan (2020) faced in delivering online education included 'feelings of isolation from students and colleagues, inconsistent teaching evaluations, and varying degrees of academic freedom and curriculum control'. Counselling and innovative means of standardisation are required to deal with these challenges.

A study conducted by Black and associates (2020) analysed the conditions of public education across South Africa and the United States comparatively, a case is built for distinguishing between affirmative responses that leave inequitable structures intact and transformative responses that seek to address the root causes of injustice and violence amplified by the pandemic (Sara Black, 2020). This is an indication of the challenges that a first word county USA and a third world country South Africa face in terms of inequalities and the effect that these inequalities have on university education and society.

Black argued that understanding the prevailing capitalist social institutional order, and the relations it generates between spheres of production and spheres of reproduction (including education), is fundamental to theories of change that not only respond to the COVID-19 moment justly, but also avoid reproducing and deepening the conditions that made COVID so cataclysmic to begin with. By analysing the conditions of public education across South Africa and the United States comparatively, the case is built for distinguishing between piecemeal affirmative responses that leave the fundamental basis for inequality in place and transformative responses that seek to address the root causes of social inequality amplified by the pandemic.

The technocratic response to the closure of universities whilst helpful for those from fortified institutions, (i.e., supplemented through fees by families who can afford
them) are most unhelpful for those from exposed ones (those institutions under-resourced by the state that serve families who bear the burden of social reproduction alone).

The point made by Black and associates is that in the absence of structural change in society 'technophilic' responses like a reliance on online learning are bound to fail because they don't address the real causes of the digital divide in the first place.

Recommendations

Returning to online learning, this can only be satisfactorily achieved if the digital divide is addressed as a result of policy interventions by the state and universities alike and should urgently result in:

- Data accessibility for students through subsidies, grants and zero ratings
- Infrastructure availability for students through increased government spend

- Equipment availability for students through subsidies
- Training on the effective use of online methodologies for both students and staff

This would facilitate amongst others:

- Use of internet websites and YouTube
- Face to face interaction on Zoom sessions, Microsoft Teams, Skype and other Apps
- E-mail consultation and interaction on a one on one basis
- Whatsapp groups
- Online training manuals for systems such as Moodle
- Interactive chat forums and mock tests/ quizzes on Moodle

Inclusive leadership as defined by Fournier (2016) is needed to implement online learning during the pandemic but the inclusive approach is underpinned by values that are useful in any context.

Conclusions

Notwithstanding the societal critique by Black and others, after taking the above literature review and critique of different cases into account this study points to the need for adaptation and development of online learning as an imperative tool in higher education delivery in South Africa. The likelihood of fundamental restructuring of economy and polity in the short term is remote as organised socialist opposition to the neoliberal orientation of the democratic state is virtually non-existent with only small fractured pockets of resistance characterising the leaderless resistance seen in daily public protests. A more equitable system of production, reproduction and distribution, as envisaged in Nancy Fraser's concept of participative parity, and an essential prerequisite for a civilisation that can deal with pandemics in a humane and holistic way, is presently an unlikely prospect.

The normative core of Fraser's (1998) conception is the notion of parity of participation. According to this norm, justice requires social arrangements that permit all (adult) members of society to interact with one another as peers. For participatory parity to be possible, at least two conditions must be satisfied. First, the distribution of material resources must be such as to ensure participants' independence and "voice." Second, the institutionalized cultural patterns of interpretation and evaluation express equal respect for all participants and ensure equal opportunity for achieving social esteem. Both these conditions are necessary for participatory parity. Neither alone is sufficient. The first one brings into focus concerns traditionally associated with the theory of distributive justice, especially concerns pertaining to the economic structure of society and to economically defined class differentials. The second one brings into focus concerns recently highlighted in the philosophy of recognition, especially concerns pertaining to the status order of society and to culturally defined hierarchies of status. Thus, a bivalent conception of justice oriented to the norm of participatory parity encompasses both redistribution and recognition, without reducing either one to the other.

As much as this pandemic has brought with it massive human suffering across the globe, it has presented an opportunity for policy makers and leaders in higher education to assess successes and failures of deployed technologies, the costs associated with them, and also the opportunity of evaluating these technologies with a view to improving access (Mhlanga & Moloi, 2020). The fact that South Africa is the most unequal society in the world is reflected in every area of social life. It is especially stark in the digital space and if left unattended has the potential to deepen the chasms between rich and poor as access to the fourth Industrial revolution and its benefits for humanity will be denied to the underclasses; more so in South Africa, due to its rigid class nature and the perpetuation of historical disadvantage, than in other societies. The South African government must of necessity accept the functional imperative of budget reallocations and redistribution if higher education is to continue apace and in the essential quest to join the world community of developed nations. Historical errors such as enormous spending on fighter jets and submarines underpinned by corruption which again raised its ugly head during the pandemic needs to be powerfully rejected in favour of education , health and welfare which may be delivered through 4IR technology.

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Selected case studies from Eswatini: dealing with the COVID-19 pandemic in the education sectors

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Abstract

In this paper the authors want to share some case studies from the kingdom of Eswatini. Selected initiatives by individuals, preschools, primary and secondary schools, and tertiary institutions from the small Southern African country will showcase reactions from the education sector to the global COVID-19 pandemic. For example, in a preschool situated in an urban setting, which caters for children from middle-income families, crisis management immediately kicked in (closure of the facilities, take home packages). In a primary school for children from mixed economic backgrounds, a WhatsApp group was used to ensure schooling continues. At two of the country's universities, an e-learning path was followed, with both success and failure. And in a non-formal education institution, students took the lead in coming up with innovative ways to ensure continued learning. While closure of educational institutions was mandatory (as per government's decision), some institutions went online (or partially online) and others did not. Certain important lessons can be drawn from these case studies. These will be presented in the final part of the paper.

Keywords: COVID-19, Disruptive Innovations, Remote Emergency Teaching And Learning, Formal And Informal Education Sector, ICTs

Introduction

The kingdom of Eswatini, a small developing nation in the southern part of Africa, was suddenly confronted with COVID-19 at the beginning of March. On the 13th of March 2020 the first COVID-19 case in the country was reported and on the 29rd of March the country went into a partial lockdown following the government's decision.

The sting of COVID-19 was felt across all levels of the education in Eswatini – early childhood, primary, secondary and tertiary levels following the Prime Minister's pronouncement of a state

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of emergency with regard to COVID-19 on the 24th of March 2020. The common expedient response amongst tertiary institutions in Eswatini was to immediately close the institutions and replace face-to face learning with online learning, which is magnified by many education pundits as the redeemer for education programmes. Tuition delivery through e-learning systems and chat technologies (Swazi Observer: 4/04/200) became the norm across all four regions of Eswatini in both publicly and privately owned institutions. The institutions discussed in the paper were no exception. While this great deal of hype was propelled by the pandemic, it has also engineered prospects for redesigning teaching and learning practices and may take over various levels of education in the foreseeable future.

This paper puts together a few short case studies in view of highlighting some of the reactions experienced by various educational stakeholders. These are – as case studies – not representative of a general, widespread reaction to the pandemic, but offer, each in their own way, the possibility to learn precious lessons from the urgency and emergency in a socio-economic situation that leaves a lot to be desired. The paper combines 5 brief case studies (preschool, primary school, secondary school, higher education and the informal education sector) conveniently chosen from institutions to which the researchers had ease of access. The main and general observation that can be drawn from the various individual reactions (influenced also by governmental and in particular Ministry of Education decisions) is the initial feeling of panic and urgency, followed by a more rational approach.

Literature Review

In view of the emerging literature on the impact of COVID-19 on the provision of education around the world, in general, and in Eswatini, in particular, we looked at similar environments as those obtained in the kingdom. As the time of publication, there was little literature available on both Eswatini and Lesotho (another small kingdom in the southern part of Africa), so we cast our web a little wider to include research findings from other African countries (e.g. Aborode, 2020; Wodon, 2020), nevertheless noting Azevedo *et al.*'s (2020) research findings which provide useful estimates on the impact of the pandemic on schooling worldwide. Crawford *et al.*'s 2020 paper entitled "COVID-19: 20 countries' higher education intra-period digital pedagogy responses" did not include any African country.

Research on the impact of COVID-19 on preschools focuses mostly on feeding schemes (e.g. Guan *et al.*, 2020; Zafitsara and Velo, 2020). Similarly, nutrition and health-related provisions in primary school are most researched in publications from the African continent (e.g. Fouche *et al.*, 2020; van Bruwaene, 2020). At the level of secondary and high school education, selected research focuses on STEM education in Zambia (Sintema, 2020). In addition, aspects of access to education, linked to the presence or absence of ICT infrastructure and provision, can be found abundantly.

There is significantly more research already done and still being undertaken on the impact of the pandemic on the provision of higher education globally (Marinoni *et al.*, 2020) and on the African continent (e.g. Motala and Menon, 2020; Ojo and Onwuegbuzie, 2020).

The gap in literature about Eswatini's response to the consequences of the pandemic on teaching and learning is noted.

Research Design and Methodology

This paper combines a few short case studies (preschool, primary school, secondary school, higher education and informal education). A case study allows for particular themes to be discussed in more detail as it forms part of the qualitative research paradigm. It can bring out a multi-faceted comprehension of a complex issue – in this particular case, the immediate and irreversible impact of COVID-19 on the provision of education in the kingdom of Eswatini. What follows in this article is a narrative showing the need for a collective re-thinking of education provision in times of crisis.

Research Objectives and Questions

As the main objective of the paper was to make a first exploration of how various education stakeholders reacted to the start of the COVID-19 pandemic and what measures they put in place, the research questions were as follows:

1. What was the initial institutional response to the onset of the pandemic and the subsequent governmental sanitary measures taken?
2. How did educational stakeholders endeavour to ensure that teaching and learning continued once the lockdown had been put in place?

Research Findings

The research findings are discussed below in the form of individual case studies. There might be slight overlaps in information but the information is essential to the reading and understanding of each separate case study. In the discussion, recommendations and conclusion sections of the paper, the authors then looked at overall, transversal issues and solutions. The case studies are presented in the following order: foundation phase, primary school, secondary/high school, universities, informal education provider.

Case Study 1: Foundation Phase: a preschool in Manzini

On the 13th of March 2020 the citizens of Eswatini were notified of the country's first COVID-19 case. How does a recently established urban foundation phase school react to this news about 3 and a half weeks from the end of the second term in Eswatini? According to the preschool director, she and her staff waited to receive further information before notifying parents of the possibility of early closure, also in order not to cause panic. The school's lead Grade 0 teacher had had contact with Patient 1 in the previous days. Not wanting to take any risk, the director decided to close the school's doors with immediate effect. In her own words, she stated: "We were now all at risk of exposure" (Report submitted to the authors of this paper).

Described as a "learning-through-play" centre, the school would be unable to continue operating based on its curriculum structure and chosen pedagogy without the enrolled children being on campus. The school's instructional team (director and teaching staff) then decided to base its strategies to continue academic instruction on three factors: 1. Most parents were still actively

working normal hours. This meant that there would have to be someone at home with at least a basic understanding of working with the child that they were responsible for at an academic level. This was highly unlikely as: a. Most of the school's learners were aged 2.5 to 3 years of age with no previous school instruction, thus their caregivers had no previous knowledge of what to expect or how to instruct from home, parents and nannies alike; b. Most nannies or childminders in Eswatini, at the risk of generalising, have a limited educational background and would find themselves in a potentially volatile situation if they were to take on the additional task of teaching, in which they and most parents alike had no background. 2. Activities would have to be structured as an Emilia Reggio/project/group learning environment-based task in households that potentially only had one child; 3. Activities would have to be planned that not only engaged the young learners, but the parents as well, to encourage them to put in the work with their children after work hours and on weekends.

Following these assumptions, the school put together easy-to-use take-home packages (in eight distinct categories: literacy, numeracy, social studies, socio-emotional learning (conflict resolution, dealing with emotions, self-awareness), sciences, cognitive learning, computer sciences, physical education and motor skills) with a week's worth of activities and decided to facilitate play- and project-based learning with online instruction but minimal online activity due to the median age of the learners. These packages were accompanied by an instructional leaflet, guiding parents as to why each task was proposed as the main purpose was for parents to make sense of the task. Parents received YouTube links to songs similar to those that were sung on-site every morning in the immediate past. Communication with the parents was mainly done via the PTA (Parent-Teacher Association) WhatsApp group. Since that first week, the director and her staff arrived on campus early on Monday mornings to print new materials for the week and subsequently allowed one parent in the gate at a time, spraying their hands with sanitizer as well as the returned take-home files from the previous week.

This first initiative worked well until the national partial lockdown was announced and only non-essential movement was still permitted. The school then had to revise its teaching and learning strategy and find a way to offer instruction. After reviewing several free online teaching platforms recommended by peers in the USA, school management decided on Seesaw. As a community-based platform, Seesaw allows instructors to upload activities (but also announcements, videos and Pdf documents) per grade that can be completed at any time without learners having to attend a live virtual class. It further allows peers to upload and share subject categorized short and fun activities which a child can complete in a matter of minutes with the help of a parent or childminder. This meant that the work that would have gone into the take-home packages could still be shared via the app using a particular child's unique login password or snap scan login from multiple devices, including a smartphone.

This is how the director reacted: "The responses have been nothing short of amazing and we are able to assess performance immediately and record milestone achievements. It has also given the children a sense of still being connected to their school and teachers as we share videos of reading activities, our daily songs and much more" (Report received by the authors of this paper).

Additional measures were taken immediately: the school calendar had to be revised on a tentative basis as no one knows how long lockdown will take and fees had to be reduced. The

impact of COVID-19 on this particularly responsive preschool is important to note: it is uncertain whether or not this school will be able to "survive" as fee reductions inevitably lead to staff reductions. The director wants the school to succeed but financially she is in a difficult situation with no foreseeable income apart from the highly reduced school fees (in addition, it is uncertain how long parents will be able to pay these). Remote teaching to very young children in a context that is not ICT-driven is not an easy task. Many parents also fear ICTs and are far from convinced that online learning can be a viable solution for their children.

Nevertheless, the director noted a few recommendations when it comes to online teaching and learning with preschool children: "1. Keep activities short, fun and colourful; 2. Make sure instructions are quick and easy to follow; 3. Do not host live virtual classrooms because a. It makes for a difficult situation for parents reliant on data or capped internet; b. It makes for uncomfortable situations with parents in crowded households; c. It poses an opportunity for older children to build up comparisons of home surroundings of peers; d. It puts pressure on all parties to be present during an emotionally charged and difficult time". She continued: "4. Encourage as much play as possible; 5. Limit screen time; 6. Academia will come, and it will find a way, but for now we must ensure that the most important teachings are of a socio-emotional nature; 7. Parents must be encouraged to be good listeners before attempting to "teach", even if that means getting sidetracked from the lesson or activity at hand; 8. Building bonds and ensuring the emotional growth and wellbeing of the learners is what will translate into classroom-ready, diligent students." (Report received by the authors of this paper).

In short, this overview of the immediate teaching and learning strategy identified as the most appropriate by a foundation phase small school in urban Eswatini shows some of the advantages online learning can offer in an emergency situation like the one caused by COVID-19. The school's experiences are possibly indicative of a few similar urban schools but they are different from what obtains in many rural schools.

Case Study 2: A Primary School (Malkerns)

In the case of Primary and High Schools in Eswatini, some initiatives were taken to introduce e-learning immediately when the lockdown started, but these are still at infant stages. This case study looks at an initiative taken by School X to reach learners via WhatsApp. The school is a private school located in the Malkerns area. The researchers got to know about the initiative through a grade 1 teacher who created a WhatsApp group for all the parents and gave instructions on what is expected of them and their children.

The specific objectives of this case study were: 1) to discover how teachers received the directive to conduct learning via WhatsApp; 2) to establish the method and resources used when conducting lessons via WhatsApp; 3) to document pupil receptiveness of the tasks and mode of instruction; and 4) to establish parent preparedness and feeling about the whole exercise.

Method, participants and data collection
The study used the direct and indirect observation methods which are qualitative research techniques where researchers observe participants' ongoing behaviour in a natural situation. Direct observation has been described as the gold standard among qualitative data collection techniques (Murphy & Dingwall, 2007). Observing people in their natural environment not only

avoids problems inherent in self-reported accounts (Mays & Pope, 1995), but can also reveal insights not accessible from other data collection methods, such as structures, processes, and behaviours the interviewed participants may well be unaware of themselves (Furlong, 2010). The study directly observed two participants (one grade 1 pupil and a parent). One teacher conducting the lessons provided all the information to the parents and learners. Her delivery methods were observed and noted via the WhatsApp platform. Audio clips sent by the teacher were clear and easy to understand by the pupil in the study. We also checked what was sent by the person teaching siSwati who sent work to the pupils using mostly audio clips and some text. Indirect observations were made by looking at reactions of some of the 21 parents via their WhatsApp comments.

The school embarked on a learning initiative a few days after the lockdown was announced by the Government of Eswatini. The grade 1 teacher who is key in this initiative called each parent to appraise them on what the school intended to do, namely create a WhatsApp group for all the parents with the lesson timetable. Work and assignments would be sent to the parents' group. However, pupil's work would be returned individually (directly to the teacher). Pupils were to learn siSwati and English on Mondays; on Tuesdays Maths and English; on Wednesdays siSwati and General Studies; on Thursdays Maths and Religious Education, and on Fridays Maths and English. The teacher would send work in the form of: 1) Audio clips; 2) scanned exercise worksheets (arithmetic/language, etc.); 3) Pictures of text materials; and 4) Different forms of pictures (e.g. identification of an animal/fruits and puzzle connections, etc.). No video clips were used. Children were supposed to listen to the audio clips and either write the words down, or listen to a story and answer questions afterwards.

There were mixed reactions from the parents. Next are some examples of parents' reaction to the whole exercise. Parent 1 said*, "Kindly bear with us as parents because some of us are still working and come back home very late so don't have enough time to teach the child and the school work is piling up!"* Another parent said,*"It is not like we don't want our children to learn online but it is not easy!"* Parent 3 said, *"I feel sorry for our children [crying emoji], they are going to be behind as if we don't care as parents"*.

Some parents were concerned about data for sending work back to the teacher while others felt for the teacher as to where she would get data to receive messages and work from the parents. It was later revealed that the school was footing the bill as there was a memo requesting parents who had not finished paying the school fees to do so that the online learning exercise could continue smoothly.

Parent Task/s
The main parent involved in this study was a *mother of two children*. She was not employed but had activities around the house. It was felt that she would have enough time to interact with her child. However at the beginning she had concerns on how this was going to work out. She lamented that she was not a teacher, so how would she be able to help her child? She agreed that at least at the grade 1 level she could cope, but she also wondered what would have happened if it was a higher level class. In the end she got used to the task of *teacher assistant*. However it was not easy as her other child was younger and needed attention as well. The parent

and the pupil would try to "hide" in another room for more concentration (especially the time to record the pupil's voice) and the younger child would be knocking on the door to enter.

The grade 1 child in the study had been exposed to computers and mobile devices before the initiative started. The child played computer and phone games and could use a mobile phone. The house was Internet-connected using Wi-Fi from one of the local service providers. A concern on the mother's side however was that while working on tasks on WhatsApp, messages could come in and the child could then temper with these.

One of the first activities received from the teacher was for the pupil to read a number of words. Words were sent via a picture taken from a worksheet. The child read the words repeatedly then the mother checked to see how well it was done. When satisfied, the next step was to record the child's voice reading the words. This task was done easily using the mobile phone's voice recorder. A challenge occurred as the mother could not locate where the voice sound was saved. The father of the child was consulted and directed the mother to the folder. The voice sound was then sent to the teacher using the share function.

It should be noted however that, while the said parent managed to send the voice sound to the teacher, other parents struggled and recorded directly on the WhatsApp record button and made mistakes. Also instead of using the direct teacher account, they would send it to the parents' WhatsApp group and every parent would hear what other children were reading as part of their assignments. The pupil in this study would also hear classmates' voices and would say: *"I know that is so and so"*, etc. which indirectly means children heard other kids' voices.

A slight negative scenario of the above challenges is that one can hear a parent guiding the child in the background urging the child to say the words correctly. Some did not know how to delete a recording where mistakes were made therefore these voice notes were sent as is. After so many errors from parents, the teachers restricted WhatsApp so that only the administrator could send posts and parents would only receive and not use the same to send back the work. They should send directly to the teachers' WhatsApp account.

The siSwati lessons were a challenge as the mother of the child in the study did not speak or understand the language. In actual fact she would use the child's siSwati experience to help understand the work to be done. If the task was more difficult, then a neighbor's child who is in a higher grade was consulted.

Other parent challenges included the taking of clear photos of the child's work done. A grade 1 child's handwriting sometimes does not remain within the middle part of the page. Also faintness of using a pencil on a ruled paper made it difficult to capture a perfect picture, which meant parents ended up taking several pictures.

Teacher Concerns

The teacher would remind parents often that they should not help the children too much. They need to be able to work on their own. The teacher therefore encouraged parents not to correct the pupils where they needed to use their own understanding. She said she would correct them once work was received. Once the work marked, a voice message was sent to the pupil to

commend him or her for a job well done. In some tasks a star was placed on the work when returned to the child.

Another concern was that some parents did not submit pupils' work on time. The teacher would wait before sending lesson 2 until the work for the first lesson had been submitted. The numerous reminders sent by the teacher revealed her frustrations.

Pupil reaction to the delivery mode

The pupil in this study was very receptive of the work and always looked forward to it. Before the lockdown the pupil would leave home at 7am for school. During the lockdown slowly the pupil was sleeping longer (sometimes up to 10am). When the school's initiative began, the teacher would send work as early as 8.30am. This meant that when the child woke up, work would be waiting. Sometimes the child would want to do the work even before brushing his teeth or having breakfast which could lead to a fight with the mother.

In some instances the child and the mother would argue about a task given. The child would say "*my teacher likes it this way*" and the mother would have a different opinion. They had to compromise for work to continue. In another instance the child would start crying saying the teacher would be cross if the work was not submitted immediately. The child would say, *"I am even shaking Mummy!"* This was a very interesting observation. While the child was working from home, the teacher's image was clearly seen by the child. Thus, being scared. The child also knew that lesson 2 would be on the way, therefore work had to be sent immediately. The mother would not accept sending work with errors, incomplete or if the child had not understood. The mother would coax the child to go back to work.

One interesting observation was the use of *Scooby snacks.* Scooby is a cartoon character (Scooby Doo). Normally tough tasks are given to Scooby. Many times Scooby would say no. So the other characters would coax him with a Scooby snack and he then gladly did the task. So the mother in this study sometimes had to say to the child, *"Will you go back to do your work if I give you a Scooby Snack?"* The child would happily say yes and go back to work.

Findings

This particular case study revealed that it is possible to run online or home lessons at the lowest primary school level using online platforms such as WhatsApp. With good planning and preparations on the part of teachers and parents it is possible to help the children to an extent. The authenticity of pupils' work submitted by parents may be questionable in some instances where parents or guardians do the work for the children. Under the current difficult circumstances (COVID-19 and lockdowns), there wasn't enough time to prepare the teachers, pupils and parents alike. As an experiment, the research reveals a positive direction.

Major challenges (e.g. not all the parents were available to assist the child or had proper gadgets for use) should not hinder this process. In a discussion seen on television on the same type of challenge in Tanzania, parents were concerned whether they should leave home their mobile gadgets to assist the learners. One parent suggested leaving the phone home and getting those cheap phones for communication purposes while away at work. Another was afraid to lose

important pictures and videos or messages which could be erased accidentally by the child. It is a sacrifice on the part of the parents to use their gadgets as a learning tool for their children. Findings also revealed that parents are willing to assist their children though there are challenges such as not having enough time to help learners, handling of mobile gadgets and perhaps not to be too harsh to the children when they make mistakes. This requires training just like teachers who are well trained.

Recommendations

The study makes the following recommendations: 1) Teachers should be equipped with more online learning skills, especially in preparation of materials and resources; 2) Parents should be encouraged to have separate mobile devices to use (such as tablets) for these types of tasks; 3) Since some of the feedback is sent back via pictures taken from pupil work done, different types of writing materials and dark pencils should be used to make it easier for picture capturing; 4) Parents should expose children gradually to friendly tasks on mobile devices (such as recording their voices and taking pictures); 5) Schools should make this system or platform of learning a permanent one, not just during crisis situations.

Case Study 3: Thinking on our toes: What works for our students in this COVID-19 era: a case study of a secondary school in Eswatini's Manzini region

Disruption of the 'normal' as known has been the main feature of COVID-19. This effect has been experienced by both students and teachers at schools around the country. This case study assumed a qualitative approach, is premised on the constructivist paradigm and seeks to use the disruptive innovation theory as propounded by Christensen *et al.* (2011). It focuses on a high school in the Manzini Region of Eswatini. Twelve students doing Form Five were purposely selected as participants drawn from four subjects: Business Studies, Biology, Religious Studies and siSwati. The four subject teachers were also purposely selected as participants. Data was collected using the semi-structured interview method. The study sought to answer the following basic questions: how were teachers able to reach their students during this time, what challenges did both teachers and students encounter, what disruptive innovations did the teachers use to enhance learning in their various subjects; and how did the teachers bridge the gap on the school's non-use of cellphones by students and the demand for such devices by the pandemic situation. In addition, we examined how the school addressed this emergent situation and how prepared the Ministry of Education was to fundraise for schools during this pandemic. It is hoped that the findings will inform issues of policy and government-led funding of the country's schools. Lastly, lessons learnt in this case could be extrapolated to other schools in other regions in Eswatini.

Experiencing the pandemic and the subsequent lockdown

The lockdown brought mixed feelings amongst learners, shock, fear of catching the illness that gradually changed to feeling annoyed since it was evident that this year's examinations would find students' ill prepared. One student noted: "*I was devastated when I heard about the lock down. Not because I don't understand they are somehow helping us as a nation, but thinking as*

a student with dreams, I just saw my future walking away (sic). Lockdown deprived us of many things leaving no one to blame".

Sadness was another feeling that was experienced by students as they saw their future being at stake due to the unfinished syllabus. That was aggravated by information that, COVID or no COVID, examinations were going to be written (and repeated, for example, here: http://new.observer.org.sz/details.php?id=13509). Here are some of the statements by students: *"When I heard of the lockdown I was so sad because (sighs) because my future was at stake and my biggest fear was that we had not completed the syllabus at school and I was so sad at the same time because they had said COVID or no COVID we were going to write the exam. And then lockdown came meaning it was the end, not really the end but it was painful because even the teachers were not teaching properly in the groups. So I was so sad I felt like my life was being shattered and my future was at stake".*

These findings are consistent with what has been observed by the WHO (2020) that the COVID-19 pandemic brought fear and other mental stress on people. Specific to students, David *et al.* (2020) noted that students face the anxiety of not knowing how their school year will progress. This is due to the practical stagnation in the school curriculum. Students are anxious because they know they will have to write external examinations before the year ends.

How did teachers organise and reach their students during this time?

Of note here was that it was not the teachers who organized or formed the study groups, rather it was the students who did so. This was confirmed by one teacher: *"A student asked for my number from other teachers and called me asking to add me in their group and I said yes".* This was confirmed by the students as well: *"We tried by all means to get contacts for our teachers, created groups on WhatsApp to communicate with them and get help academically, we also had lessons with teachers who are willing to help. While some thought it was futile".* This finding is consistent with Christensen *et al.* (2011) who advocated for a learner-centric type of learning, where students discover the best way they can learn as opposed to the "normal" class routine.

Challenges encountered in effecting e-learning

The main challenge here was that some students did not have cellphones, which was consistent with the school's expectations for students not to have/not to bring cellphones to school. One teacher observed the following challenges: *"Some learners did not have phones and some complained about data lamenting they were from poverty stricken backgrounds. More than 70% of those in the group didn't submit their assignments in my inbox, which left me with more questions about if the group was helpful or not since one could not know if they indeed see the online assignments or not ''.*

The students also registered challenges: *"There are so many challenges I had to face, I would sometimes miss classes because we did not have a proper timetable. Trying to avoid missing classes I have to stay online the whole day and that would affect me because I had to buy data more often. Another challenge is that some topics are not meant to be taught online so when teachers taught those, I did not understand and there was no way they could help.* Another student had this to say: "*Well at times you find that the classes clash with each other, like the*

time. So you have to catch up on both classes, I had to sacrifice and focus on one class then the other one I will do a catch up later when I am done with the other".

Consistent with the disruptive nature of the COVID-19 and its ability to overwhelm systems, in developing countries this was bound to be magnified, as observed by David *et al*. (2020).

Use of disruptive innovations to enhance student learning during the pandemic

Instead of the normal classroom scenario where the teacher delivers content, teachers posted material in the groups and students were to interact with it before the teacher would summarize it. Trying to ensure that students were learning on their own and not being dependent on the teacher was innovative. The use of online learning using WhatsApp, Google Classroom, etc., provided students with links to materials such as past examination papers and other resources. It cut down on the dependency observed in normal classrooms where students come ill-prepared and wait for the teacher to lecture. One teacher commented: *"Learners were encouraged to read and cover material alone then I will just summarize without me leading them on as they were used to".*

Bridging the gap between school policy on cellphones and demand for their use during pandemic

The effect of the school's policy on the use of cellphones (see http://www.times.co.sz/news/13914.html quoting Minister Ntshangase in 2009 on the ban of mobile phones in schools) posed a challenge as some parents had not bought cellphones for their children. This delayed the online lessons as the parents had to buy the cellphones first. When asked if the policy affected the lessons one teacher had this to say: *"Yes, since some parents didn't bother buying cellphones for their children since they were told they are not needed in the studies. So in the beginning of the online learning I had two parents calling me asking if I can delay just a week for them to buy the cellphones for their daughters".*

In order to bridge the gap between the demands for the prohibited cellphone and the school policy, teachers had to give assurances to parents about the legitimate use of the gadgets by the students. One teacher said: "*I promised the parents that the cellphones were going to contribute positively".*

How the school addressed this emergent situation?

Most respondents were of the view that the school did not do enough to assist in the implementation of the online sessions, such as allowing the teachers to use the school's wifi. What the school did was to implement the government's decision to close the school and to warn students to stay at home not to catch the coronavirus. However, more was expected from the school as seen in the following comment by a student: *"I would have wanted the school to respond in a way that every teacher is able to reach out to their students, right now not every teacher is able to reach out to us".*

How prepared was the Ministry of Education and Training to fundraise for schools during this pandemic?

Most respondents were of the view that the Ministry was not prepared to fundraise for schools during the COVID-19 era. The Ministry should have ensured that online learning was supported as well as the other modes of learning. Although lessons were offered through radio, television and print media, these were not viewed as useful enough. One student had this to say: *"The Ministry was not prepared, like the lessons offered on radio were not effective. Most schools are using cellphones, I feel the Ministry should have tried to do the same because not everyone listens to the radio. The way they teach on radio is not ok like, how can you teach RE [Religious Education] in siSwati, this is confusing. When sitting for the exam we are expected to respond in English yet the teachers use siSwati and they read the siSwati Bible, this confuses us".* This finding is consistent with the observation made by the World Bank (2020) which shows countries that have taken initiatives to support education during the COVID-19 pandemic. eSwatini is conspicuously missing from the list of countries that have adopted educational technology in support of education during this pandemic (IMF, 2020).

How and if the Ministry of Education and Training could have improved its preparedness for this pandemic

Most respondents were of the view that, because of the nature of the pandemic, the Ministry tried the little it could. It provided print and audio lessons, even via visual media. However, student support was not enough, also the use of social media such as WhatsApp would have been better than these media, as one student noted: *"Firstly this pandemic was not expected to spread this fast and no one was in control over it. For any preparation that the Ministry did was their best, but they should have also tried to use cellphones like we are doing with our teachers. I feel like The Ministry tried but it would have been useful to combine the technologies to enhance the learning, the audio alone seems to be not effective. Also the Ministry would have provided resources for students, like (chuckles) I know this is exaggerated...Like laptops to do video calls so that we could see the teachers, and the teachers could monitor who was attending class and who was not".*

Lessons learnt in this pandemic

Going the technology route seemed to be the best option to effectively curtail the spread of COVID-19 whilst ensuring that students were learning. One teacher had this to say: *"It is my expectation that all schools do away with physical books and have all books in soft copy so as to minimize the transfer of COVID-19. All assignments must be submitted online to avoid exercise books from carrying COVID-19 between learners and teachers".* This finding suggests a shift from what is normally expected in a normal formal education setting to "new" ways of teaching and learning in the post COVID-19 era. This is consistent with Christensen *et al.* (2011) who noted that disruptive innovation puts a demand to change how we learn.

Case Study 4: Mediated Learning during the COVID-19 pandemic: a) a case study of a university in the Manzini Region of Eswatini, and b) a case study of the University of Eswatini (Eswatini)

The Kingdom of Eswatini has a number of tertiary institutions, including the Southern Africa Nazarene University (SANU) and the University of Eswatini (UNESWA). One of COVID-19's profound effects in many countries and Eswatini was to shake up tertiary level education

provision by forcing masses of learners and academics to observe the mantra of stay at home and stay safe. In the heat of the moment, tertiary institutions made gallant efforts to convert traditional face-to-face to online learning, which triggered mixed reactions from various stakeholders.

A university in the Manzini region of Eswatini

The basic intent of this qualitative case study was to reflect on the preparedness of the institution to acclimatize to the interruption caused by the pandemic, and to explore interventions provided by the institution during the pandemic and to ameliorate the quick-fix solutions offered during the pandemic. Data collection was carried out through a semi-structured interview, document and audiovisual material analysis.

Active Learning

The institution under discussion espoused active learning as an innovative pedagogical strategy to improve the quality of teaching and learning prior to the COVID-19 pandemic (Pillar 1 Strategic Plan: 2015-2020). Literature evidence also proves the integration of an Open Distance Learning (ODL) strategy by the institution.

The constructivist theory is the heartbeat of active learning. Constructivism subscribes to the notion that we all construct our own perspectives of the world through individual experiences and schema, and focuses on preparing the learner to solve problems in personally authentic situations (Dunlap and Grabinger, 1995). From an Open Distance Learning stance, active learning is generally defined as any instructional method, strategy or approach that actively engages students in the learning process. In defining the phenomenon Barnes (1989) underscores the following principles that underpin active learning: a) Purposive: applicability and configuration of the task with the qualification and module outcomes, b) Reflective: students reflect on the meaning of what is learnt in order to apply the learnt behavior, knowledge, skills, values and attitudes to the real world, c) Negotiated: negotiation of outcomes and methods of learning between students and the academics, d) Critical: students must appreciate diverse ways and means of learning the content, e) Complex: students must be able to compare learning tasks with complexities existing in real life and making reflective analysis, f) Situation-driven: the need of the situation and context is taken into consideration in order to establish learning tasks, and g) Engaged: real life tasks are reflected upon in the activities conducted for learning.

Methodology

The study was conducted among 190 second year students and 10 academics in the institution's Faculty of Education. The purposive sampling technique was employed to choose the research participants. The criterion for selecting these participants is that they are full-time students who possess digital literacy skills and are from diverse backgrounds. Additionally, the academics selected in the study offer modules at this level during the second semester.

Findings and Discussion

In terms of policy, document analysis confirmed that the institution involved in this study is a prospective Open Distance University, with a tuition policy embedded in principles of active

learning approaches. This is laudable and in line with the 2011 Moscow Declaration on Digital Information Preservation and the 2012 UNESCO-Commonwealth of Learning Paris Declaration on Open Educational Resources (Education Sector Policy:2018). However, the major question remains about the applicability of the active learning model as the nonexistence of a framework to drive its implementation was noted.

Practice

Three weeks before the COVID-19 lockdown, the institution held a workshop to capacitate its full-time academic staff on Inquiry-Based Teaching and Learning, which resulted in adjustments in module design, development and learning practices. It was observed during the workshop that at least fifty percent of the full-time staff used technology-enhanced teaching and learning through the use of personal mobile devices such as cellphones and laptops across all subject areas. A robust shift to blended delivery became the norm after the training. Generally, the blending of face-to-face and online delivery was well received by a majority of the students who were using the Wifi connection on campus.

When the university closed due to the pandemic, management issued a directive to the effect that all classes would be offered online via electronic platforms including Google Classroom, WhatsApp and via email until further notice. In a bid to enhance effective teaching and learning the institution embarked on an initiative to train part-time staff on the use of Google Classroom, a week into the lockdown. Overall, audiovisual material analysis confirmed students' and academic staff's preference for WhatsApp (100% enrolment) and email more than Google Classroom (50% enrolment). Interviewed academic staff had mixed reactions. On a positive note, the proponents of Google Classroom viewed this as a pleasant learning curve out of people's comfort zones which led to some having full attendance. However, it was noted that the platform was solely used for sharing learning materials and assignments. Those in favor of Google Classroom undertook not to give tests through the platform after noting that students struggled to submit assignments on time. Moreover, they decided not to penalize students for late submission. In addition, those in favor of the Google Classroom platform appreciated its automated marking feature, which they believed would alleviate the stress of marking big classes.

Students felt that those who had the privilege of having access to the internet, excelled. In actual fact these students were able to access diverse online resources, actively participate in the platforms and even meet submission deadlines. However, others lamented the fact they received learning resources which they needed to read on their own without the support of the lecturers or peers. On the contrary, Google Classroom opponents cited expensive mobile data, unimpressive enrolment of students and lack of compatible devices as deterrents. One lecturer described the Google classroom experience as "heart-wrenching and devastating" following students' reaction after a call for an online test: the lecturer received several mobile telephone calls demanding her to stop giving these online tests. Furthermore, some students demanded clarity from the heads of department through WhatsApp forums regarding the negative feedback they got from Google Classroom after they wrote tests and quizzes. In response to that the concerned lecturers noted the gap and allayed the students' fears by committing to marking manually while the institution upgraded its systems.

A truckload of excuses were registered by the students through the WhatsApp forum in reaction to the Google Classroom platform: "There is no network coverage", "My battery is dying…I could not charge due to a storm the previous day". Some raised inequality concerns of access to the internet and devices which the students used. They noted that they were self-sponsored and could not afford the expensive internet data.

Some lecturers attested to not having network access in certain parts of the country. Others observed that the current context constrained teaching, learning and assessment practices, owing to expensive internet data challenges for students and lecturers similarly. On another note, lecturers whose courses require practical work or field work expressed their frustration. Following deliberations over the staff's WhatsApp platform, it was noted that clarity on these issues would be provided in due course.

The University of Eswatini

The University of Eswatini, commonly known as UNESWA, has an Institute of Distance Education (IDE) which recently celebrated its 25th anniversary. In 'normal' times it caters for learners who for a variety of reasons are unable to attend traditional classes. They are then taught using a blended learning mode: limited face-to-face classes and online, self-study environments, mainly through the Moodle LMS and/or WhatsApp. When the lockdown was announced the University was taken aback. Management encouraged all its lecturers and tutors to continue using the online mode (now leaving behind any face-to-face interactions) – for those teaching in IDE – and to start doing the same – for those who previously relied on classroom interactions only. Management is yet to announce how the remainder of the semester/year will evolve.

The reactions from staff and students were quite different. Some staff happily went about teaching online, sharing resources, giving assignments and even tests, while others encountered numerous challenges (no wifi at home, limited access to the office, limited motivation to switch to another teaching and learning environment, general apathy linked to the COVID-19 onslaught) and felt scared and anxious because of the COVID-19 pandemic. Similarly, certain students were keen to continue learning while others lamented the new responsibility of having to buy data, accessing resources without having the necessary smartphones and/or laptops, dealing with household (looking after siblings, cooking, cleaning, etc.) or work-related tasks (working from home requires a complete overhaul of routines in many cases).

In order to better accompany the teachers and learners in their online venture, UNESWA set up a task team which made recommendations. As a matter of urgency, webinars were organized on a variety of themes (uploading resources onto the Moodle platform, effective communication skills during online teaching, online facilitation, etc.) and a university-wide online course for teaching online will be held in May 2020.

Recommendations

While both institutions have certain policies in place and are cognizant of the importance of soft skills such as those needed to teach and learn online, many challenges remain. The first reaction from these institutions was to make content available online, but can access to course content be equated to meaningful learning? If active learning is the standard, then more is needed. This will entail providing continued professional development for full- and part-time personnel. Likewise, students have to be armed with the necessary academic and technical/technological skills to function in a constantly changing world.

In addition, the institutions must invest in technological infrastructure to support its pedagogical approach while being cognizant of the institutions' context. An extensive audit of devices owned by students needs to be undertaken to inform teaching-learning strategies aligned to ownership patterns of students. Academic staff has to be more comprehensively involved in decision-making, also in order to curb prevalent inequalities based on different access to ICTs, to internet data, etc. The establishment of partnerships with government and private enterprises for funding purposes is imperative.

Case Study 5: Non-formal Education in the COVID-19 pandemic time - What has changed? A Case Study of a non-formal education agency in Eswatini

The purpose of this final qualitative case study was to find out what the COVID-19 pandemic changed in the way teaching and learning took place in a non-formal institution located in the Hhohho region of Eswatini. Non-formal education unlike formal education does not demand face-to-face interaction between the teacher and the learner. It offers some flexibility on how the learners learn, through the use of modules and limited residential sessions.

The purposive sampling technique was used to recruit informants in this constructivist case study which was based on the humanistic learning theory, emphasising two purposes: firstly, education must promote human development and personal growth, and, secondly, human nature is basically good. This means that humans have a natural inclination to learn, grow and develop fully. Thus, education is most effective when it aligns with this natural inclination. Humanistic learning theory describes learning in terms of these natural tendencies. Five common goals of humanistic education emerge from this, education has to 1. facilitate the development of fully functioning, self-actualized human beings who have the capacity to nurture themselves, others, and their environment; 2. instil a joy of learning and a desire to be life-long learners; 3. promote the discovery of each student's passions, special talents, and abilities; 4. teach the knowledge and skills necessary for students to be good decision makers and effective problem solvers. 5. enable students to be responsible world citizens who are able to contribute to democratic societies (Johnson, 2020).

 The case study sought to establish the challenges that both educators and learners faced during the COVID-19 pandemic. It sought to answer the following questions: how efficient were the current modes used for learning? How prepared were the learners to adapt to the disruption caused by the pandemic and how effective were the interventions offered by the institution to

alleviate the learners' stress and confusion? What were the lessons learnt from the COVID-19 pandemic?

Research context

Emlalatini Development Centre (EDC) is a non-formal government institution located in the Hhohho region of Eswatini that provides alternative educational opportunities through Open and Distance Learning (ODL) programmes to junior and higher secondary education levels in Eswatini. EDC targets the adult and youth population with the following needs: i) those who could not complete school and want to study, ii) those who did not do well in some subjects in formal high school and want to upgrade for tertiary education eligibility, and iii) those who suddenly want to change their careers and need to study subjects suitable for their new career paths (Government of Eswatini, 2020).

Modes of delivery and learner support

The method of instruction at EDC is through distance learning with the use of print (modules). Learners are given printed study materials during registration and receive the following: i) residential sessions, ii) trial examinations, iii) twice-a-week face-to-face sessions. On the other days in the week learners are encouraged to come to the institution for individual help if they face difficulties with their work (Government of Eswatini, 2020). Overall, it has been noticed that learners tend to rely on the contact sessions more than on independent learning, hence, the conditions brought on by the COVID-19 pandemic disrupted the normal teaching/learning in the institution because the learners now had to rely on their independent study only.

Findings and Discussions

Current modes of learning, preparedness of learners in the face of COVID-19, effectiveness of the interventions, learners' coping strategies

As an ODL institution EDC uses print-based modules as the main mode of instruction. Previous research indicates that the use of modules was seen as effective for learning, however, they were also viewed as inefficient. When one informant asked an education about the effectiveness of the learning mode, s/he had this to say: "*Effective but inefficient because it is costly and feedback to learners is delayed by weeks or months. It is mostly asynchronous rather than synchronous. ICT interventions are minimal. We only use the phone*".

This basically revealed that learning at a distance had its problems, especially where not much support is received by the institution in terms of additional staff, technology and independent tutors to assist learners. This defeats the observations by Carl Rogers who indicated that learners are able to learn when education initiatives are aligned with the natural inclination of the learner to learn (Johnson, 2020). This finding confirmed observations made by Musingafi, Mapuranga, Chiwanza and Zebron (2015) who also found that ODL learners in Zimbabwe experienced difficulties in accessing and using ICT and that feedback to learners was ineffective.

Another respondent, a learner who was asked whether the use of modules was effective in their learning had this to say: "*It would have been more effective if the institution had introduced an effective blended learning approach to enhance our mode of learning to avoid relying on the*

printed modules which also need a lot of revision". The findings indicated that the learners found it difficult to easily fit into the ODL practice. This was mainly because learners felt that the learner support system was not effective as some study materials needed to be reviewed and the introduction of an effective blended learning approach was at a slow pace.

It was further observed that the learners were not prepared for the pandemic. Although some interventions were made, it became difficult to access and utilise the technology that the institution provided because the learners were not adequately prepared. One educator had this to say: "*Learners were never prepared for the COVID-19 disruption. No one knew how it was going to affect everything".* And one of the learners said: *"It was very unfortunate that no one knew this was coming. It just came in as a bang and of course we were not prepared for this disruption".* This finding is consistent with the paralysing effects that are brought by the disruptive nature of the pandemic. Most people had to think on their toes, not knowing which intervention and strategies were going to be useful (WHO, 2020).

As an institution, EDC tried to solicit assistance to set up some technical interventions to alleviate challenges during the pandemic. However, these efforts were watered down by challenges which have been found to be common with many African students, such as lack of the relevant gadgets, inaccessibility in terms of expensive data bundles and lack of / poor network coverage where students reside. One educator noted the following: *"EDC made an arrangement with an Online Learning Management system provider to enable our learners to continue with their learning. EDC instructed all Study Centre Coordinators to register all our learners on the system. Many couldn't afford to utilise this platform because they didn't have smartphones or laptops to connect to the internet. If they did, data bundles were too expensive or the network coverage was poor".* This was echoed by a learner: *"It is true that as much as we were not prepared for this disruption, the centre had an LMS in place but we cannot use it, we are not so confident in using it. However, we were in the process of registering in the study centres and 'bang' came this disruption.   This becomes very stressful".*

This indicates that, even though efforts were made to put these interventions in place, they were nonetheless deemed not to be effective. These were the observations made by one educator: "*For the above mentioned reasons, to a larger extent the interventions were not very effective because the learning system didn't follow the module system the learners are used to. Because of travelling restrictions, learners couldn't get all their modules. The LMS system is also complicated for many".* Similarly, a learner observed: *"Some of us don't have the gadgets to connect to the internet in order to access the system. Those who don't have money to buy data bundles which are very expensive and the network is sometimes inaccessible".* This concurs with earlier studies in developing countries which established that the majority of ODL learners in developing countries were challenged with both lack of experience in the application of technology and absence of these technologies (UNESCO, 2004; Mbukusa, 2009).

In an effort to help learners cope and reduce stress levels a number of interventions were put in place by the institution such as the use of the institution's Facebook page and WhatsApp group as well as giving out the principal's cellphone to students. This is what the principal of the institution had to say: *"My cellphone, EDC's Facebook page and EDC's WhatsApp Group helped to answer many of the learner's questions and thus helped in reducing stress and anxiety amongst*

the learners. Their major concern is payment for the ECESWA examinations fees and writing of their national exams''. This finding indicates that learners were more conversant with social media platforms than with the institution's LMS, which, in turn, shows the need for training on the use of the instructional technologies.

The lessons learnt from this case study included the need for a national drive to promote e-learning and move away from the traditional face-to-face mode of teaching. This was noted by some of the study participants: *"Classroom face-to-face education is unable to cope with pandemics of COVID-19's magnitude compared to online learning"; "It is time Eswatini invests on technology enabled learning, blended open and distance learning and online learning".* The finding shows that as an ODL institution EDC should fast-track the establishment of structures and systems that would make blended learning an effective teaching and learning tool in order for learners to be conversant with both methods to curb the problems encountered when one method is no longer accessible.

Overall lessons learnt, recommendations and conclusion

This paper proposed a number of short case studies to give an overview of how different educational sectors in Eswatini (Southern Africa) reacted when the pandemic started and during the lockdown which ensued the start of the spreading of the coronavirus. From these studies of a preschool, a primary, a secondary/high school, two tertiary institutions and a non-formal education agency, it can be concluded that the COVID -19 pandemic disrupted our education system to a large extent and caused high levels of stress and panic to occur amongst students and teachers alike. In some cases, parents or students took the initiative to create classes and in turn recruited their teachers into these classes, an indication of an innovative way to continue learning during these hard times. In others, the teachers led the introduction of new ways of teaching and learning. In others still, the Ministry of Education and Training proposed teaching and learning via radio, television and print media. There is need for further research on the reactions and coping mechanisms of parents and other stakeholders, in line with the study done by Fouche *et al.* (2020).

Seemingly, the use of cellphone learning was the preferred way by many stakeholders, such as teachers and learners/students. However, this was impeded by the challenges of internet connectivity (Crawford *et al*., 2020; Ojo and Onwuegbuzie, 2020), access and cost of data bundles (Motala and Menon, 2020). Coupled with this was the logistics of class scheduling and synchronicity. Many institutions did better when using asynchronous ways of teaching (and learning). The Ministry of Education was found to be lacking in providing support for students and teachers during this time.

Here are some recommendations emanating from the case studies above: the Eswatini government, together with private providers should ensure that all students have a smartphone or a laptop and sufficient data (better still, educational content should be zero-rated) to access materials and interact with educators and peers; schools should consider cellphones as learning tools and should support students in their usage rather than discourage them to use them; the Ministry of Education and Training should consider introducing e-learning and online learning as

a requirement in all schools in the country as it was noted that many educators and learners did not meet the 21st-century technological demands.

While online learning was not immediately possible due to the many challenges identified in this paper, it was felt that in future institutions should introduce blended learning approaches with emerging technologies, virtual platforms and pod/screen/audiocasts in addition to what seems to have been useful straight away, social networking platforms such as Facebook and WhatsApp (Ferreira-Meyers and Martins, 2020). This intervention could be useful to both learners and education in emergency situations such as that of COVID-19.

There will be need to further research on the critical role proper ICT resources and the role parental involvement plays in ensuring education continuity, especially in preschool and at primary/secondary/high school level, during and after the crisis (Gouëdard *et al.*, 2020) as it has been noted that the hysteresis[6] induced by school closures may be more prevalent among students from less privileged backgrounds.

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[6] According to the OECD Policy Responses to Coronavirus (COVID-19), Education and COVID-19: Focusing on the long-term impact of school closures - 29 June 2020 (https://www.oecd.org/coronavirus/policy-responses/education-and-COVID-19-focusing-on-the-long-term-impact-of-school-closures-2cea926e/), "In labour economics, hysteresis usually refers to the long-term effect of unemployment on a worker's ability to find a job. It could refer in education to the long-term impact of school closures on students' outcomes".

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Opportunities, challenges, and experiences with digital teaching during the COVID-19 pandemic

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Abstract

Teaching in tertiary institutions in South Africa, is predominantly done through the face-to-face approach. However, due to the onset of the COVID-19 pandemic, all institutions suddenly adopted online teaching methods without any consideration for potential adverse effects thereof. This research aimed to determine the opportunities and challenges faced by lecturers and students during the period of online teaching and learning - induced by the COVID-19 pandemic. A case study design was adopted for this research. The data was collected using focus-group interviews via skype. The interviewees comprised eight BED lecturers and four ancillary staff who train students and lecturers in the use of the Blackboard system, as well as providing technical support during online teaching and learning. Two class representatives also provided the data through a WhatsApp group. Documents analyses and personal experience, during a five months period, complemented the data obtained from the interviews. Eighty percent of the students relied on University computer laboratories to complete their assignments online. In this respect, the university management was prudent in providing low rated data, laptop computers, digital textbooks and printed course materials to create learning opportunities and reduce the digital divide amongst students. In conclusion, this study revealed that the success of online teaching and learning can be attributed to the availability of efficient technical support through readily available technology, peer learning and self-motivated learning. The skills learnt during the COVID-19 era can be used to teach both undergraduate and postgraduate students after the pandemic.

Keywords: Opportunities, Challenges, Online Teaching, Technology, Digital Divide, Support

Introduction

Several studies revealed that many lecturers fail to integrate technology due to deficiencies in their own professional preparation (Harris, Mishra & Koehler, 2009; Vrasidas, 2015; Haydn & Barton, 2006; Lawless & Pellegrino, 2007). This might be because programs for pre-service lecturers do not offer adequate education technology courses to enable lecturers to integrate technology in practice (Haydn & Barton, 2006). This inadequacy in training programs leaves only a few lecturers with the ability to effectively use technology in their classrooms and for online teaching. Many studies (Cullen & Green, 2011; Sang, Valcke, Van Braak, Tondeur & Zhu, 2011; Smarkola, 2011) revealed that sufficient motivation is needed for lecturers to learn and integrate technology in their teaching practice. Professional preparation by lecturers teaching into pre-service higher education programs thus plays a pivotal role in ensuring that trainee university

lecturers will in future use technology in their classrooms and online teaching and learning (Chai, Koh & Tsai, 2010; Ottenbreit-Leftwich et al., 2012).

The availability of devices and quality of internet connection may further influence individuals' use of technology. According to Schwab (2018), only twenty-two per cent of households in South Africa own computers but only nine per cent, in rural communities. Only fifty-four per cent of the adult population has access to the internet. Eleven percent have access to the internet at home, seventeen percent access it from work, whilst twelve percent access the internet through internet cafes and educational facilities (STATSSA, 2017; Schwab, 2018). Statistics also reveal that eighty-seven per cent of social media users apply mobile phones for communication. Therefore, social media on mobile phones is the most-used platform for South Africans. Current educational policies do not emphasise the integration of digital skills in the learning process (Schwab, 2018). There is a significant effect on digital skills development created by the lack of systematic large-scale developmental programs or curriculum changes (Schwab, 2018). Naidoo & Raju (2012) state that the lack of ICT integration in the school curriculum is the reason for little or no ICT experience among South African undergraduate students coming from secondary schools with inadequate ICT resources.

The COVID-19 pandemic regulations induced emergency online teaching and learning without providing lecturers and students sufficient opportunity to familiarise themselves with efficient online technology (Teräs, Suoranta, Teräs & Curcher, 2020). Studies on the failure of lecturers to integrate technology due to deficiencies in professional preparation (Harris et al., 2009; Vrasidas, 2015; Haydn & Barton, 2006; Lawless & Pellegrino, 2007) were conducted under different circumstances where options for blended learning or full face-to-face instruction existed. Thus far, this current study is unique in that it explores online learning opportunities, experiences and challenges faced by lecturers and students. During the COVID-19 state of emergency, there was no opportunity for traditional face-to-face learning. The sudden change from face-to-face to full-on online learning motivated the researcher to explore the opportunities and challenges faced by both lecturers and students.

The following research questions guided this study: What opportunities were created for lecturers by the sudden shift from face-to-face to emergency online learning? What are the challenges experienced by both students and lecturers because of this sudden change to online learning?

By identifying the kinds of challenges that could be faced in a sudden online environment, this study aimed to strengthen institutions of higher education. Such knowledge can guide decision-making and strategies for both supporting academics, and students.

Social Cognitive Learning theory

Albert Bandura's (1986) Social Cognitive Theory (SCT) guided this study. Bandura's theory posits that learning occurs in a social context with the interaction of behaviour, cognition, other personal factors and environmental factors influencing each other in a bidirectional manner (Bandura, 1989; Vinney, 2020). According to the SCT, people learn by observing actions of others

by considering the consequences experienced by other people, rehearsing (at first mentally) by imitating behaviour, taking action by trying the behaviour themselves and by comparing their experiences with those of others. This theory can be applied to almost any social and behavioural change communication program that aims to influence social behaviours involving interactions with other people (Vinney, 2020). Social learning principles can be used to demonstrate how an individual can overcome those challenges and succeed by changing the perception of the social environment, and providing social support to people who want to change their behaviour.

According to Vinney (2020), efficacy and modelling are the most important concepts of the SCT. **Efficacy** is the ability to produce the desired or intended result or effect. **Modelling** refers to the use of messages that show someone performing a desirable behaviour. Observational learning requires individuals to pay attention to the person performing the behaviour in order to learn something new. The individuals must be able to retain new information about modelled behaviour and can later modify the information and use it in new situations. Furthermore, there is a need for motivation to practise the new behaviour in order to improve its efficiency.

Literature review

Saifuddin and Lykkegaard (2016) highlight three aspects that might cause the digital divide in higher education, namely social exclusion resulting from low income, digital exclusion due to lack of devices or internet services, and variations in accessibility of services in rural and urban centres. Williams (2020) suggests that although online learning and blended learning have gradually been introduced into the Western world, most African countries like Nigeria do not have such programs, and learning is conducted solely through face-to-face interactions. A study by Warren (2007) revealed that most of the population in rural communities have limited access to online learning opportunities. Rye (2008) indicates that internet services are expensive. There are shortages of internet providers in remote areas in both developed and developing countries. Due to the cost of internet services and variations in internet availability in rural and urban areas, technology may exacerbate the existing inequalities (Gorard, Selwyn & Williams, 2000). Furthermore, Warren (2007) recorded fewer home computers in residences of developing countries, and thereby limiting experience and efficiency in using computers. However, in their study in Spain, Ricoy, Feliz and Couto (2013) observed that only a small percentage of students could not afford to acquire ICT devices or had no expertise in the use of technology. The study revealed that the problem of people with no devices and lacking the skills to use technology is more profound in developing nations compared to developed nations. Madigan and Goodfellow (2005) advise that in cases where multifaceted problems exist, it is critical to initially solve the issues of device availability and internet accessibility before addressing the issues of technology literacy. People can engage in online courses to improve their literacy and efficiency in accessing online learning opportunities where devices are available (Li et al., 2015).

There are numerous challenges associated with digital online teaching and learning. A study by Naidoo and Raju (2012) found that South African students display significant variations in their ICT competencies because of the differences in internet access (thus, digital exclusion) and experience with the use of computers. Lane (2009) observed that inadequate computer experience is due to socio-economic challenges (thus, social exclusion) when devices are

unaffordable and therefore, become inaccessible. This, in turn, results in insufficient digital skills to apply in the use of technology (thus, digital exclusion). An example of how it can affect a lecturer's teaching can be found in the 2020 study of Walan, who observed that teaching time is lost when a lecturer has to assist students with technological skills deficiencies (Walan, 2020).

The use of technology has inherent advantages. Walan (2020) observed that technology enables students to present information in different ways such as quizzes and group discussions. The student gets immediate feedback. Furthermore, technology can assist students to prepare before the lesson as it is possible to post the content in advance. Technology enables variations in teaching methods due to numerous technological tools (Walan, 2020). WhatsApp is one example of this. Studies have indicated that WhatsApp supports collaborative learning and sharing of information among students, in line with the SCL. Hence, there is increased access to educational resources regardless of distance (Rambe & Chipunza 2013; Maphosa, Dube & Jita 2020). WhatsApp provides a cheaper platform which is readily available to most students. Maphosa et al. (2020) suggest that WhatsApp can support learning in the 21st century through a learner-centred approach.

Research methodology

The qualitative assumptions of this study are based on the researcher's personal experience with BED and PGCE students with data collected from two focus group interviews with eight lecturers and a third focus group interview with four support staff members from the Centre of Teaching and Learning. The interviews were conducted over Skype to avoid the possibility of interviewees contracting COVID-19 infection during the interviews. Personal student information was collected by two student class representatives through a WhatsApp group. The participants were purposively selected as they were teaching the target group or provided support to the target group. All reported personal experiences and focus group interviews focused on opportunities and challenges faced by lecturers teaching BED fourth year students in online teaching and learning environments during the COVID-19 lockdown period. Furthermore, the focus group interview with ancillary staff collected information on the support provided to both lecturers and students during the lockdown period.

One focus group interview with eight lecturers was held in July, and another in August 2020 with the same participants. The relevant data was recorded by writing down the pertinent issues as the interview proceeded. A PowerPoint presentation was conducted during the second interview to member-check the accuracy of the information collected during the first interview; the presentation was uploaded on Skype before the interview commenced. Focus group members confirmed that the notes in the presentation were a true reflection of what was said in the previous interview. Any information that deviated from what was said, was corrected. Furthermore, the results were complemented by a focus group interview with four support staff from the Centre of Teaching and Learning (CTL). Ancillary staff provided additional insights as to how students and lecturers were supported. The CTL further presented a document that highlighted the support rendered to both students and lecturers complementing the notes taken

during the interview by the researcher. All focus group interviews lasted between 30 and 45 minutes.

Triangulation of data sources as well as methods (focus-group interviews, document analysis and observation), was necessary to ensure that the results were reliable. The prolonged period of observations – from March 2020 to August 2020 – added to the reliability of the data.

Data analysis

The qualitative sets of data obtained from the interviews were analysed through thematic content analysis, which involved reading the notes and the document to identify and categorise the data into themes and sub-themes, recognising patterns, and interpreting the data. The main themes, the opportunities and challenges, were derived from the research questions. Sub-themes emerged from the collected data and irrelevant data was discarded. Data derived from the researcher's personal experience was added to the subthemes. The results were then presented in a table (as seen in Table 1).

Ethical considerations

Ethical clearance was obtained from the University Ethical Committee and informed consent obtained from the participants who voluntarily participated. They were free to withdraw from participation if they so wished. Where some participants rejected permission to record the interview, field notes were taken without any direct quotations.

Results and discussion

The summary of opportunities, challenges and experiences in teaching and learning are presented in Table 1. Environmental factors such as support for both students and lecturers and social factors such as peer interaction among students and lecturers were essential in the successful implementation of online teaching and learning. Cognitive factors, where lecturers had to explore new ways of assessment, were vital in ensuring the successful implementation of the online teaching mode. Student motivation by the academic advisory team was also important in engaging students who were not familiar with the new learning process. The skills learnt by both students and lecturers can be used in the post COVID-19 period.

Table 1: Summary of results on challenges, opportunities, and experiences by lecturers and the CTL during the online learning period

Opportunities	Challenges
Student and lecturer support Virtual Private Network (GlobalProtect) and data allocation to all lecturers and students. Distribution of laptops to vulnerable students. Digital textbook access to all lecturers and students (CTL).	**Digital Divide** CTL (Centre of Teaching and Learning): Workshop presentation and document analysis; UFS Centre of Teaching and learning: 80 % of students rely

Lecturer support
 D and E: Free online workshops, e.g. LUMAT on STEAM education and peer learning.
  D: CTL offered online courses to lecturers - Introduction to teaching online; Formative assessment; Summative assessment; and Assessment planning.
 	
  Peer support among lecturers.
	on UFS Computer labs to complete online activities.
	C: Students complaining about connection issues, so the lecturer is also uploading recordings onto Blackboard (Bb) after sessions on Bb collaborate. Some students had to travel to places where there is a network to access resources.

Student support
    CTL: Academic advising team focused on providing students with support and encouragement to help them deal with the change in the learning and teaching environment.
        Printed material made available to students who had severe network challenges.
	Technology problems
	  C: Experienced difficulty with his online teaching and learning. Nevertheless, with the assistance of members from CTL, he was able to continue.
	  A: Uncertainty about the practical sessions as it was not clear how soon we would return to campus.
	  A: Videos were posted.

B: Exploring Bb and new ways of assessment. D: Setting questions in sets and randomising the question sets to minimise sharing answers.	
B: Voice-overs for PowerPoint presentations. C: Using PowerPoint presentations, including voice notes.	
F: Attendance rate of students increased during online teaching. Students learnt to be independent, and often made a follow-up on what had been taught through emails.	B: Fewer students attended online sessions as compared to face-to-face lectures.
E: Students seemed to like the arrangements where learning materials were posted on Bb, and they could access them in their own convenient time.	E: Challenge of assignments submission by students. Various reasons for failing to submit on time.
Class representative A	
A few students had both: (1) Network and data challenges (2) A few students had network, data and device challenges	

Class representative B
A few students in each case had the following problems: (1) Network challenges only (2) Data challenges only (3) Both network and data challenges (4) Network and device challenges

Communication
    B: Created WhatsApp groups where the lecturer communicated with student representatives and students.
C: A WhatsApp group and discussion boards were created to clarify concepts.
D: Students were reluctant to engage in WhatsApp group discussions
      E+CTL: Lecturers joined WhatsApp groups, shared resources, and were contacted by their students for support.
      Communication channels were open with much sharing and interaction, particularly between peers.
      Some of the main additional support needs identified by students include further emphasis on time management, remote study skills, staying motivated and focused, and how to approach assessments.

Implications
    A: A realisation of the importance of the online resources available for teaching and learning. This implies that at times, it may be necessary to take leave to work from home not only to do research but also to learn the use of Bb Collaborate.
 	
    B: Skills learnt during the COVID-19 period will still be applicable in a post-COVID-19 era. Teaching BED can now be done using Bb Collaborate or PowerPoint with voice, instead of the previous practice of teaching the students late at night.

Key: A, B, C, D, E views from different participants in the study

Discussion

The PowerPoint presentation from the CTL indicated that eighty per cent of students enrolled in rural universities rely on on-campus computer laboratories to complete their online activities. Therefore, the university needed to reduce the digital divide when the COVID-19 forced transition occurred from face-face instruction to an online mode of instruction. The university achieved this by providing the low cost Virtual Private Network (GlobalProtect), digital textbook access and data allocation to all lecturers and students. This data provision was critical. A study by Rye (2008) indicates that internet services are expensive and therefore, the provision of low rated data would increase learners' access to learning opportunities. Moreover, data provision reduced the existing inequalities in rural and urban areas (Gorard, Selwyn & Williams, 2000). In addition to data provision, students from low-income households received laptops. The provision of laptops reduced digital exclusion due to a lack of devices in higher education among students who lived in rural and urban centres (Saifuddin & Lykkegaard, 2016; Schwab, 2018).

It was vital to prioritise the problem of device availability and internet accessibility before addressing the issues of technology literacy (Madigan & Goodfellow, 2005). Although most of the digital divide challenges were addressed, the dilemma of network availability remained unresolved; hence, some students had to travel to nearby towns or growth points where they could access a network to download learning resources. Students who encountered severe network challenges had printed coursework material couriered to them. The provision of data, digital devices, and the low cost GlobalProtect network as well as printed material, reduced the digital divide between students from different socio-economic backgrounds. According to the Social Cognitive Theory (SCT), it was critical to create a suitably supportive environment for both lecturers and students so that they can overcome the inherent challenges in order to adapt quickly to the new mode of teaching and learning.

Furthermore, opportunities were created for free online workshops on new ways of teaching and learning. One international workshop was offered by LUMAT: International Journal on Math, Science and Technology Education. The workshop provided opportunities to learn more about different topics such as STEAM education. Since this topic is taught to pre-service teachers, the workshop provided different perspectives that are critical to shaping approaches used to teach novel concepts used in STEAM education. It also provided useful additional resources to apply in teaching. Thus, opportunities for empowerment, enrichment in terms of teaching resources, and collaboration with conference members were opened up. Studies have shown that training improves work performance and teaching effectiveness (Asiyai, 2016; Omole, 2014). According to the SCT, observational learning from technology experts enabled lecturers to master and retain new skills needed in teaching specific subject-related content.

New approaches to prepare and present teaching materials were also unlocked. These include importing screenshots into a PowerPoint presentation from different documents such as PDFs, and allowances to incorporate audio and narrations to the slides uploaded to the learning platform. Alternatively, the audio could be recorded on a laptop and imported to the PowerPoint slideshow. It is also possible to add suitable online pictures and videos, or to import them from a personal computer to enrich the presentation. Presentations enriched with texts, pictures, audio, and video stimulate different senses and create opportunities for students to understand and remember what they learn (Yasin, Mustafa & Permatasari, 2017). Personal factors such as the willingness to learn and practise new skills, and environmental factors such as the availability of peers who were willing to assist, were critical to ensure the acquisition of the relevant skills.

Presentations uploaded onto the Bb learning platform were essential in accommodating students who had to travel to where they could access the internet for downloading the learning resources. Such presentations could be used by students during revision sessions, thereby eliminating the need for revision sessions with lecturers. PowerPoint presentations enriched with text and audio are valuable to students where network challenges exist; they can download the material as the network becomes available. Furthermore, such material could be useful during the post-lockdown period as it provides learners with the opportunity to revise work accompanied by explanations from previous lectures.

One participant indicated that the CTL was available to support teaching and learning while attending to problems encountered by lecturers and students throughout the day. Furthermore, lecturers were supported by fellow lecturers who are more experienced in using technology. The same collegial form of support as observed by Walan (2020) was observed by teachers in the study reported here. They assisted each other in the use of digital technology and also accessed other digital platforms and Facebook communities to obtain advice. This also supports the SCT of learning, where modelling and peer interaction is deemed crucial for learning. According to this theory, lecturers learnt by observing actions of the presenters from the CTL. They rehearse the suggested activities and implement actions in their classes with adequate access to presenters (more knowledgeable others) who were available (through phone calls and Skype) to assist in solving challenges throughout the day (Bandura, 1989; Vinney, 2020).

A study by Yuen and Yaoyuneyong (2017) indicate that both learner-to-learner interaction and learner-to-lecturer interaction are essential to enhance the mastery of skills and concepts. Support in teaching and learning is pivotal for new staff members who are being taught how to use the Bb system in setting online tests and assignments. The observation that some lecturers lacked technological skills is consistent with a study in China, where lecturers lacked the skills necessary to use ICT effectively in their classroom practice (Xie, Xie, Yang & Hao, 2015). Li (2017) also observed that the inability of lecturers to use ICT in their teaching was a challenge in higher education. Furthermore, the study by Molotsi (2020) showed results that were also consistent with the observation in this study; some of the participants were proficient in the use of technology while others needed a significant amount of training. Peer learning, therefore, was also essential in closing the knowledge gap among lecturers.

The Centre of Teaching and Learning provided further support through workshops on online teaching, formative assessment, and summative assessment using Bb tools. Lecturers learnt about new presentation and assessment techniques, including ways to reduce the sharing of answers by students. They also learnt about the importance of providing an assessment plan to students to assist them in planning and managing their work. Lecturers also consulted each other as they encountered challenges. The social environment and social support among lecturers enabled the lecturers to adapt more easily to the new teaching techniques. Studies reveal that peer-to-peer interaction improves the rate of understanding and promotes higher achievements (Wang et al., 2015; Ramesh et al., 2014).

The skill of setting questions in sets and randomising the questions to be answered by each student reduced the chances of sharing answers by students. Each student received a different set of questions each time they attempted an activity. In addition, the information and technology (IT) unit provided technical support in the installation and use of applications such as Skype for business, Bb collaborate and Zoom. This presented opportunities for contact sessions in teaching and learning. The IT unit further provided the low cost global connect to both staff and students, making it possible for them to conduct and attend workshops, lectures and conferences at a minimum cost. Furthermore, the library provided links to free online resources, making it easier to access valuable resources for lectures and research. With regard to support, the observations in this study are in line with the recommendations by Xie et al. (2015) that in respect of training higher education lecturers, it is essential to learn from the experiences of

developed countries. However, Walan (2020) observed that two teachers who participated in the study were proficient at handling technology and did not attend any training courses. This indicates that a needs analysis should inform the training of lecturers in an organisation.

Students were supported by the academic advisory team that provided encouragement and psychological support for them to deal with the changes in their learning and teaching environment. This type of support is in line with the SLT that emphasises the need for motivation to practice the new behaviour in order to improve efficiency in the behaviour. During the counselling sessions, more emphasis was placed on time management, remote study skills, staying motivated and focused, and how to approach assessments. Furthermore, students created WhatsApp groups that were also joined by lecturers. Social networking can promote the development of positive feelings of classroom connection among students, while it also enhances positive perceptions of the learning experience (Hung & Yuen, 2010). Sergiovanni emphasises the critical role of lecturers in creating a bond between students and lecturers when they pursue common goals and values (1994).

There were several other challenges associated with online learning. While some lecturers enjoyed an increase in attendance, others experienced a decrease in the number of students who attended online lectures compared to face-to-face lectures. This could have been a result of motivation by some lecturers, or that students preferred to attend specific lectures and avoided others. The most critical challenge was the failure of science lecturers to perform hands-on practical activities. However, videos and some practical activities posted online enabled students to practice these skills, using data generated from previous internet searches or from textbooks. Moreover, some students did not submit their assessment tasks on time, citing internet challenges. Lecturers had to be more flexible to accommodate these students. It was, however, difficult to prove the truth concerning the internet challenge claim. Some students in rural communities experienced network, data and device challenges consistent with reports by STATS SA 2017 and Schwab 2018.

Conclusion

Digital support through the provision of data, devices, academic advisory support and technical training is instrumental to the successful implementation of online teaching and learning at a university where students come from various socio-economic backgrounds. Furthermore, peer interaction, student- and lecturer interaction as well as discovery learning, are essential in achieving learning goals online. Lecturers acquire new ways of preparing and presenting teaching material, and students are more exposed to learner-centred approaches where they had to read- and listen to audio presentations from their lecturers. PowerPoint presentations with voice-overs are useful for students who prefer to learn in their own time. Practical skills development is not easy to achieve during online learning. Technological support for both students and lecturers from the Centre of Teaching and Learning and the IT department section is necessary to ensure the successful implementation of this novel online education approach.

Implications

The importance and benefits of some of the online resources for teaching and learning are evident; it is not always possible to be present at work but lecturers can use online resources to present lectures online. The skills learnt throughout this lockdown period could still be applied in the post-COVID-19 era while teaching BED honours students who sometimes have to attend lectures late at night. To facilitate learning, the Bb system as well as PowerPoint with voice- or video presentations can be used to present lectures online while students are at home.

Recommendations

More research needs to be done to establish whether or not the differences in network availability had a significant effect on the performance of learners.

Strengths and limitations of the study

The reliability of the qualitative data was improved through member checking, triangulation of data sources and personal experience (five months) with online institutional modes of teaching and learning. However, it was not possible to include verbatim responses since some participants did not give consent to record the focus group interviews. Therefore, data was collected through note taking. All participants allowed the researcher to take notes during the discussion.

Conflict of interest

The author declares no conflict of interest.

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Students Awareness and Perception of Open Educational Resources: A case study of the International University of Management, Namibia

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Abstract

The Sustainable Development Goal 4 (SDG 4) aims at ensuring an inclusive equitable quality education and promotes lifelong learning opportunities for all. Towards achieving SDG 4 and as a way to make freely make available, high quality educational materials, Open Educational Resources (OER) offer free accessible educational materials for reuse (use content unaltered), redistribution (share original/ revised/remixed content with others), revising (modify content), remix (combine content) and retain (make, own & control copying of content). OERs rely on sharing of resources that inspire inquiry, equality and accessibility within a wider community; thus going a long way towards addressing challenges faced by a category of persons in accessing education material. Considering the availability of OERs and the intent for making them available, there is the need to ascertain the awareness and perception of OERs: this paper therefore investigated the awareness, perception and attitude towards OERS. Applying a quantitative method to collect data from 80 postgraduate students at the International University of Management in Namibia, analysis of the data was undertaken. The study revealed that OERs awareness is to a high extent and that there is positive perception of OERs. It is recommended that creation of OERs by universities/colleges be promoted so as to improve available specificity of materials to students'.

Keywords: Open Educational Resources, Sustainable Development Goals (SDGs), Social-cultural , Economic issues, Awareness, Utilization

Introduction

As declared in the world education forum in Incheon, South Korea on 15 May 2015, the Incheon declaration called for meaningful education and training opportunities for the large population out-of-school children and adolescents, who require immediate, targeted and sustained action to ensure that all children are in school and are learning (Lueddeke, 2018). Following the just ending Millennium Development Goals (MDGs) and the Incheon declaration, 193 members of the United Nations agreed on the new Sustainable Development Goals (SDGs) in September 2015, aimed at eradicating poverty (ICLEI, 2015). Education is elementary to human dignity and hence described by the United Nations High Level Political Forum (HLPF)(2019) as a basic right. This is evidenced in the SDGs as it has a number of education-related targets and indicators and

hence making it a reciprocal linkage across the 2030 Agenda. Among the SDG education-related targets and indicators include climate change mitigation (Target 13.3), responsible consumption & growth (Target 12.8), decent work (Target 8.6), gender equality (Target 5.6) and health and well-being (Target 3.7). The importance of education as evidenced in the SDGs education-related targets & indicators, Incheon declaration and previously MDGs enabled it to be explicitly formulated as a standalone goal in the SDGs (SDG4). As enshrined in the SDG, SDG 4 aims at ensuring an inclusive equitable quality education and promoting lifelong learning opportunities for all.

The significance of education is reiterated by the United Nations High Level Political Forum (HLPF) in 2019 that indicated that education plays a central role in building sustainable, inclusive and resilient societies and hence access to quality education, serve as an avenue for social mobility; thus reducing inequalities (HLPF, 2019). In adopting 2030 Agenda, Governments around the world, committed to providing inclusive and equitable quality education at all levels and promoting lifelong learning opportunities for all society (United Nations ESCAP, 2015). As a result, Governments around the world have put in place various initiatives towards achieving the SDG 4 by 2030 and prominent among these is primary education as highlighted in the 2015 MDG report (United Nations, 2015). Though a great success for the world, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in their statistical year book on quality education (SGD4) indicated that, equitable and good-quality basic education for all is broader than primary education as it encompasses inclusive access to and participation in "quality" learning and attainment of higher degrees of education United (Nations ESCAP, 2015).

A contributing factor to achieving quality learning and attaining a higher degree is through access and use of high quality educational content and materials. Accessing high quality educational content and material is faced with different challenges in different countries. Among these include lack of access, poor quality, low available good-quality and high annually increasing cost (Butcher & Moore, 2015) materials. Examples supporting this as cited by Butcher & Moore (2015) include the increased textbook cost by 82% in the periods of 2002 to 2015 and as a result, 65% students' inability to purchase textbooks in developed nations; indicating a possible worse case in developing countries. To make freely available high quality educational material, Open Educational Resources (OER) offer free accessible educational materials for reuse (use content unaltered), redistribution (share original/ revised/remixed content with others), revising (modify content), remix (combine content) and retain (make, own & control copying of content) (Wiley, 2014; Willems & Bossu, 2012). OER rely on sharing of resources that inspire inquiry, equality and accessibility within the wider community; thus going a long way towards addressing challenges faced by different countries in accessing higher education (Kumar, 2019).

The pervasiveness of the Internet, ability to copy and distribute digital content has served as a catalyst for growth of OERs. Known to be initiated in 1999, while the University of Tübingen (Germany) and The Open University, UK, released some educational resources for free, the Massachusetts Institute of Technology (MIT, USA) pursued further the concept of OER by offering 32 courses with open licenses in 2001/2002 (Butcher & Moore, 2015; UNESCO, 2015). Following this, UNESCO open courseware forum in 2002, coined the term OER. Thereafter the Cape Town

Open Education Declaration (2008) and the Paris OER Declaration (2012) provided guidelines and encouragement for governments to release educational resources, especially those created using public funding, with open licenses (Butcher & Moore, 2015; UNESCO, 2015; UNESCO, 2012; UNESCO, n.d.). Other OER sources include the University of Michigan in partnership with the OER Africa which has shared more than 150 resources in health education (Lesko, 2013). Other OER initiatives in Africa include Teacher Education in Sub-Saharan Africa (TESSA) and University of Cape Town (UCT) Open Content (Mtebe & Raisamo, 2014).

Massive disruption of education due to the COVID-19 pandemic has affected 1.57 billion learners in 191 countries across the globe. In response to this disruption, UNESCO issued a global call to support learning and knowledge sharing through Open Educational Resources (OER). The call highlighted that, access to OER is fundamental for ensuring learning continuity and can help meet the needs of individual learners. In addition OER can effectively promote gender equality as well as incentivize innovative pedagogical, didactical and methodological approaches (UNESCO, 2020). In the same vein, OER Africa reiterated its support for African educators and students to harness the power of open content during the COVID-19 Pandemic (OER Africa, 2020).

Considering the availability of OERs and the intent for making them available as enumerated above, there is the need to ascertain the awareness, perception and attitude towards it. This paper therefore investigated the awareness, perception and attitude towards OERs. Findings of the study will add onto existing literature on OERs, its contributions to achieving SDG 4 on inclusive equitable quality education and promotion of lifelong learning opportunities for all irrespective of time, place and circumstances (like the recent outbreak of COVID-19).

Literature review

In Sub-Saharan Africa where resources in institutions of higher learning are scarce, Open Educational Resources (OERs) hold great promise; and have been lauded for their ability to improve equality in education, potential to increase teaching efficiency, improve quality of teaching and reduce economic and geographical barriers to education. Moreover, use of OER has led to a blended learning and progressive changes in the methodology of knowledge dissemination in the past decade (Grimaldi, Mallick, Waters and Baraniuk, 2019; Kumar, 2019; Pounds & Bostock, 2019). In addition to these benefits, a study by Wright and Reju (2012) on developing and deploying OERs in sub-Saharan Africa noted that access to educational opportunities could be increased by OER; a view that is supported by Okonkwo (2012) who opine that OER plays a key role in repositioning educational provision in higher education.

In spite of the fact that OER has found its way in academia and stirred advancement in education, prior literature shows that its adoption is marred by various challenges. For instance, a study by Ngimwa and Wilson (2012) highlighted technological issues, institutional and national issues and social-cultural and economic issues as the main issues around adoption of OER in Sub-Saharan Africa. On technological issues, their study pointed out that limited and costly internet bandwidth, limited access to computers and power supply interruption were identified as a barrier to successful participation in OER development. This was partly due to the fact that some

institutions of higher learning are located in rural areas where technological infrastructure is either poor or lacking. On social–economic and cultural issues, the study highlighted lack of awareness of OER, unwillingness to find time to participate, academic pride and unwillingness to share and negative attitudes towards OER as a foreign initiative. In relation to institutional and national issues, the study identified that unsupportive institutional and national policies have an impact on readiness to adopt OER. To counter these challenges, Ngimwa and Wilson (2012) recommended the need to identify realistic and effective strategies to raise awareness of OER and use of emerging technologies to develop strategies that would strengthen and expand the existing OER practitioners in Sub-Saharan Africa.

Optimal use of OERs is to a great extent pegged on awareness and how potential users perceive them. A recent study by Kumar (2019) highlights lack of awareness, unwillingness to change, hesitation to share knowledge and resources and unavailability of OER content in indigenous languages as some of the aspects that have hindered OER adoption in the global south. A study by Ismail, Mgeni, Yunus, Abdulla, and Ahmada (2019) revealed that, OERs awareness in higher education (HE) remains very low in Tanzania as according to their study, more than 40% of students from the State University of Zanzibar (SUZA) are not exposed to OER. Limited ICT infrastructure at the said institution and the need to build the capacity of academics on OER integration were cited as a major concern and a hindrance to adoption of OER. These findings concur with a study by Mtebe and Raisamo (2014) that highlighted poor ICT infrastructure, absence of policies, and lack of skills to create and/or use OER as the main barriers to the use of OER in HEIs in Tanzania. Closely related findings were cited by Pounds and Bostock (2019). In their study, academic competition between institutions and educators, low awareness and availability of OERs and copyright policies, mistrust in OER quality, and technological limitations around adaptation and sharing were some of the main barriers to adoption of OERs.

To this effect, Nyamwembe, Tanui and Wamutitu (2018) concluded that, awareness and utilization of OER is key as without it, these resources would remain unused despite the fact that they can assist in academic work; to counter this, their study recommended sensitizing students more on OER to create awareness. Ngimwaa and Wilsona (2012) were for similar views. In their study they emphasized the need to raise awareness of the value of OER in enhancing education to all levels be it institutions or government so as to maximize use.

A study by Okonkwo (2012) found insufficient and ineffective use of OER in some institutions of higher learning in Nigeria which was attributed to inadequate experience and training. To counter this, the study recommended the need to develop training programs covering the rudiments of OER. Considering the possible roles that OERs could play to assist in academic work and the recommendations of Ngimwaa and Wilsona (2012) and Nyamwembe, Tanui and Wamutitu (2018) to sensitize students on OERs to create awareness, this study assessed the awareness, perception and contribution so as to add onto existing literature on OERs and its contributions towards achieving SDG 4.

Methodology

The study employed a quantitative method as it enabled the researchers to analyze further the OERs themes generated from the research literature. Using questionnaire, data was collected from 80 masters' degree students at the International University of Management in Namibia. The 80 students were sampled through convenience sampling. The questions of the questionnaire were based on the items generated from the research literature on OERs awareness and perceptions.

To ensure validity and reliability of the questionnaire, seven experts reviewed it and made inputs into the initial questionnaire and after modifications; it was submitted to the Research and Ethics Committee of the International University of Management, Namibia for perusal and approval. The questionnaire was then placed online and the link distributed through the student social media platform for them to visit the link and respond to the questionnaire. The first part of the questionnaire notified the students of informed consent and that they could choose to stop responding to the online questionnaire or and not submit at all. It was made clear that, opting out of the survey along the way had no consequences.

Analysis, Results and Discussion

As in Figure 1, while 61% of the respondents were aged 26 to 35 years, 39% were aged 36 to 45 years. The said aged groups above and their numbers were very useful to this study considering that quite an amount of OERs are in the electronic format and hence a youthful sample that uses the internet could affect the quality of response and also the quantity of response as the research instrument was placed online for response. As in Figure 1.0, 44% of the respondents were males, 56% Females, 45% Studying Master of Science in Tourism and Hospitality Management, 35% studying Master of Science (MSc) in Information Technology (IT) and 21% studying Master of Business Administration (with options in Finance, Management, Human Resource & Marketing). The collection of data from the different programmes of study was necessary so the researchers are certain that the results of the study were not going to be programme biased.
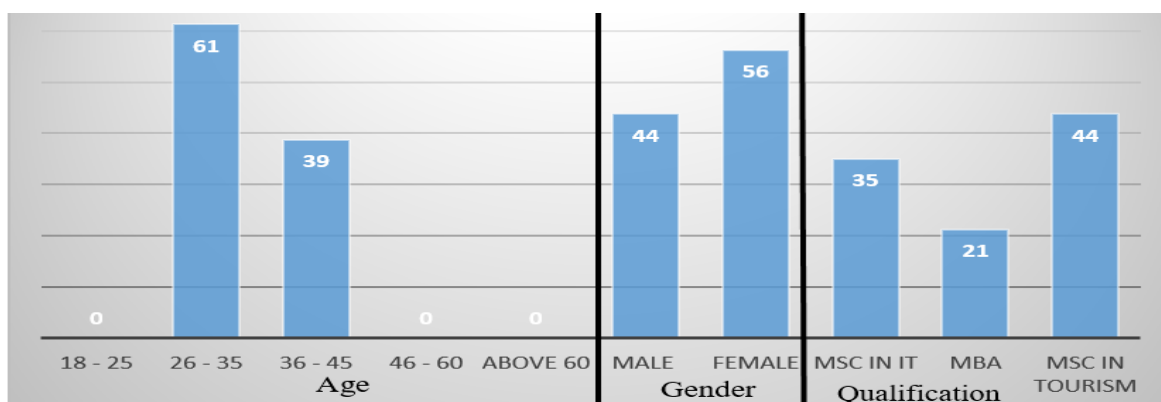

Figure 1 : Demographics in percentages

Contrary to Pounds and Bostock (2019) and Kumar's (2019) findings of low awareness of OERs awareness, Figure 2 indicates a high awareness of OERs amongst the respondents as 74% of them indicated being aware of OERs and know that, it comes with a licenses that allows it's reuse,

redistribution, revision, remix and retention as defined by Wiley (2014) and Willems & Bossu (2012). The high awareness of OERs amongst students, indicate the extent to which OERs are helping overcome the challenge of low available good-quality books and its associated high annually increasing cost as enumerated by Butcher & Moore (2015). Equally, it is also an indication of gradual success steps being taken at achieving the SDG 4 as more students being aware of OERs could lead to more students accessing them and hence leading to an inclusive equitable quality education and promoting lifelong learning opportunities for all.

Of the 74% respondents, only 35% indicated that they had or were using OERs provided by universities/colleges including the Massachusetts Institute of Technology (MIT) and Namibian College of Open Learning (NAMCOL). Considering that the respondents were aware of OERs, the low percentage of usage of OERs from universities/colleges repositories could be because the students use OERs from other repositories than university repositories.
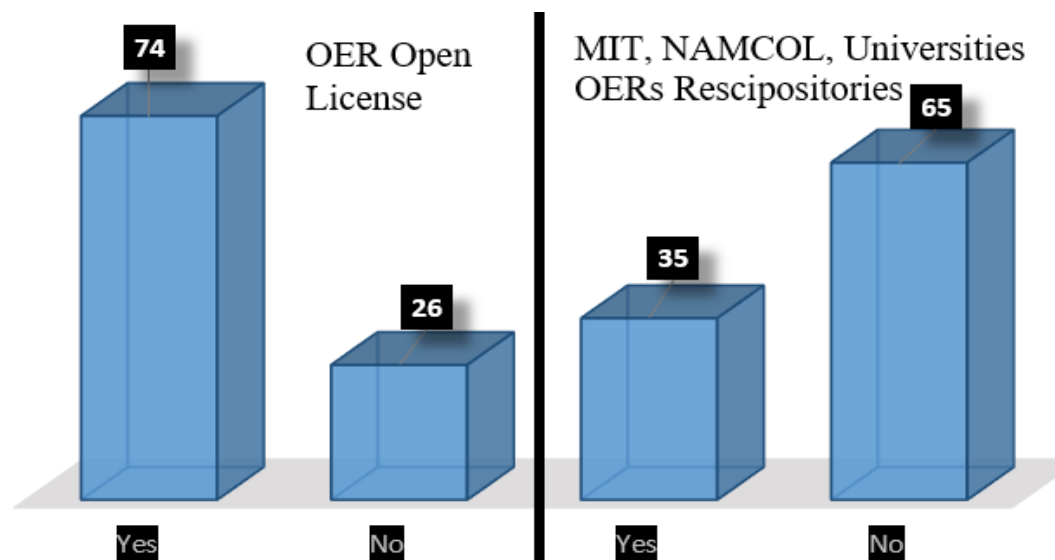
Figure 2: Awareness of OERs

Of the 74% respondents who were aware of OERs, 96% indicated that the OERs they had accessed were useful to them in their programme of study. This findings contradicts that of Okonkwo (2012) that found insufficient and ineffective use of OERs. The difference in findings could be because of the differences in the samples from which data was collected from: while data in this study was collected in Namibia, Okonkwo (2012) study collected data from Nigeria. On how the respondents access OERs, 48% indicated that, through general purpose search engines (such as google & google scholar), 30% indicated that, through recommended sites by their lecturers or library staff or other students, 4% indicated that, through universities sites and 9% each indicated that through other search engines and others (including print). Figure 3 illustrates this. Considering that universities/colleges have the capability of offering specific/tailor-made materials for their students compared to general purpose search engines and that the majority of the students currently access OERs from general purpose engines universities/colleges site, further study may be required to understand why the phenomenon. The awareness and use of OERs as above indicates students' positive perception and attitude towards OERs.
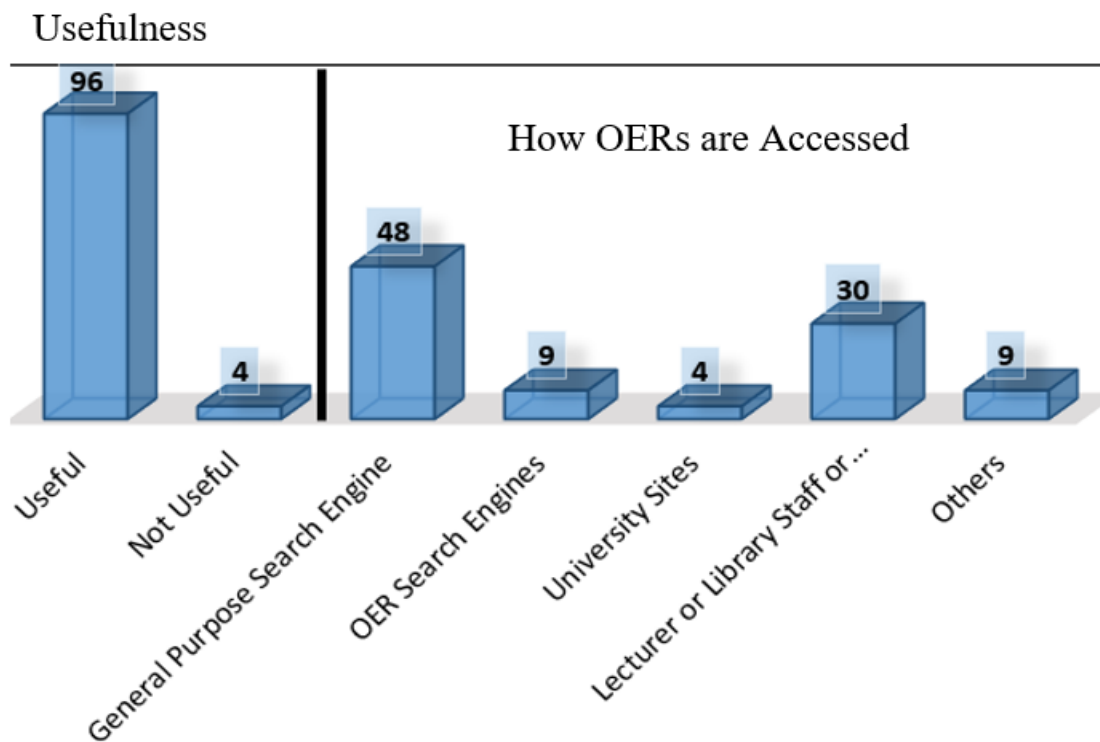
Figure 3: Usefulness and Access

On issues of concerns towards the use of OERs, as in Figure 4, the students raised the issues of ease of access due to technological infrastructure challenges, language of OERs content (usually in English), OERs quality and validity as some contents are generalized instead of tailor-made and OERs licensing as some licenses are restrictive. Notwithstanding the said issues, while 88% of the respondents indicated a continued use and facilitate sharing of OERs, 79% indicated their readiness to create OERs in future.
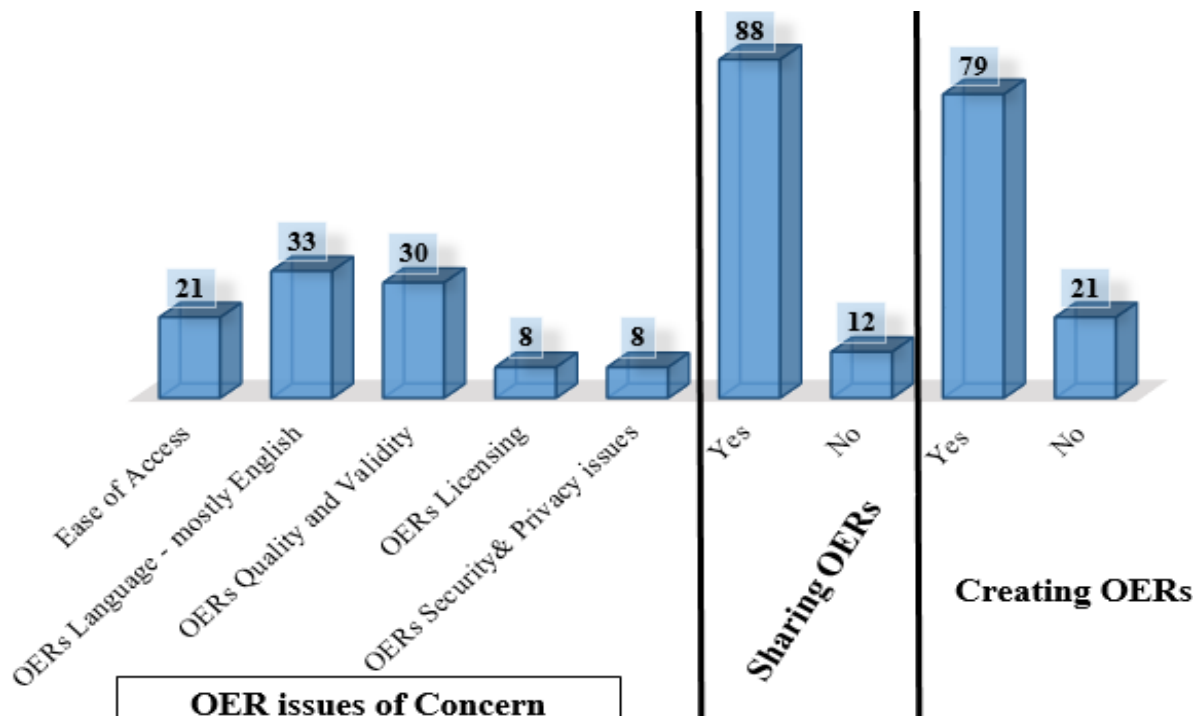
Figure 4: OER Concerns & Intention to Share and Create

Conclusion and Recommendation

Considering the availability of OERs and the very reasons for their creation as enumerated in literature above, the need to ascertain the awareness, perception and attitude towards OERs arose and hence this paper investigated students' awareness, perception and attitude towards OERs. From the studies analysis, results and discussion, it can be concluded that OERs awareness amongst students is high.

Considering that universities/colleges have the capability of offering specific/Taylor made materials for their students compared to general purpose search engines and that the majority of the students currently access OERs from general purpose engines universities/colleges site, further study may be required to understand why the phenomenon. Also considering that the study drew its sample from postgraduate studies students, generalizing the results to undergraduate students is challenging and hence similar studies for the future should include undergraduate students as part of its sample.

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Mobile Instant Messaging Applications - Online Teaching during COVID-19

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Abstract

Lately the popularity of text and instant messaging has prompted educators (Oyewole *et al*., 2020; Gon & Rawekar, 2017; So, 2016) to integrate messaging tools in higher education (HE) teaching and learning. Moreover, the global COVID-19 pandemic brought the usefulness of mobile instant messaging (MIM) applications (apps) into focus globally Significantly, for developing countries such as South Africa, the use of MIM apps represents a practicable solution to overcome challenges of restricted access to devices and data because of historical socio-economic difficulties. Our study explored the use of MIM apps to support teaching and learning of engineering students at a University of Technology (UoT) in South Africa.

Seven specific guiding principles advanced by Gachago and Cupido (2020) as 'essential design elements' required for successful remote teaching interventions provided this study with a framework to examine MIM interventions. This explorative study aims to examine the usefulness of MIM interventions from the student perspective with focus on the extent to which these principles may influence the student experience. A mixed-methods approach was used for this study which included a survey (n=188) and a focus group interview (n=16). Initial results indicated that MIM interventions were successful. Significantly, benefits included easy access to study material and instant communication, however, certain barriers such as connectivity issues, load-shedding and data depletion, emerged. The paper concludes with implications and limitations of the study and recommendations for future research.

Keywords: Mobile Instant Messaging Applications, Remote Learning, Learning Design, Higher Education

Introduction

The COVID-19 pandemic prompted universities around the world to shift towards online education, and evolutions in information and communication technology contributed towards the emergence of innovative education methods for students (Kauppi *et al.*, 2020). While there is an increased interest in understanding how universities responded to the pandemic (Bao, 2020; Greene, 2020; Huang *et al.*, 2020; Lim, 2020; QS, 2020), few studies reflect on the abrupt switch to online teaching, especially mobile learning and the significant impact on students and society. MIM apps can be used as part of an inclusive digital learning strategy (Gronseth and Zhang, 2018). Communication between students and lecturers was enabled through simple text messages and

voice notes. So (2016), defines text messaging as the "*the asynchronous mobile communication service between mobile handsets using SMS*". MIM tools enhance social presence (Tang and Hew, 2017), foster communication and collaboration among peers (Nitza and Roman, 2016), improve access to resource materials and provide peer support (Timmis, 2012).

This study ought to understand the application of two different types of MIM, WhatsApp and Telegram, across two departments within an engineering faculty, as part of class interactions, engagements, discussion platforms and content transfer during the national lockdown, when face to face teaching was not possible.

Literature Review

The foregoing commentary draws attention to valuable contributions of real-time social media tools, for instance, MIM apps during unsettling times, such as the COVID-19 pandemic. The ease of use of smartphone apps has expanded its popularity across the educational sector, in and outside the classroom. With an increase in the use of innovative technology for learning, MIM apps have been particularly instrumental in academic learning.

Mobile Instant Messaging Apps for Teaching and Learning

Mobile learning (m-learning) is a form of e-learning that encompasses all learning delivered via a portable device such as a smartphone or tablet. Research by Gon and Rawekar (2017) highlights several advantages of m-learning platforms referring to Whatsapp as a convenient tool for teaching learning activity providing easy access to course content and information and being cost-effective, more flexible and accommodating for different learning schedules when compared to traditional approaches. This is consistent with the views of Alioon and Delialioğlu (2019) who add that students' motivation, participation and even performance in courses improve as a result of m-learning implying that m-learning platforms lend themselves to be more student-centred than the traditional didactic approaches.

PulseLearning (2016) advances that m-learning involves a social learning dimension, thus inherently encourages users to communicate. In this regard, mobile apps are communication platforms that can facilitate a meaningful relationship between both teachers and learners, and learners and learners. Similarly, Gon and Rawekar (2017) believe that although there is no significant difference between knowledge gained when comparing the use of m-learning to didactic lectures, however, they add that the advantages of m-learning (technical, educational or instructional) outweigh the disadvantages. A few disadvantages they mention are message flooding and eyestrain, although these can be overcome by making small groups and using mobiles with bigger screens.
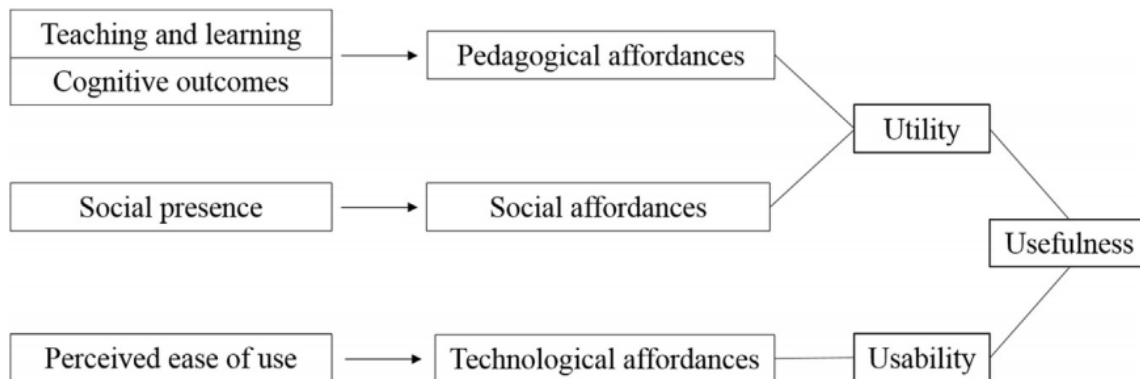
Figure 1: Usefulness of MIM Apps (Tang and Hew, 2017)

Tang and Hew (2017) aver that a useful pedagogical delivery system or application must fulfil two important components, namely 'utility' and 'usability' as presented in Figure 1. The authors define utility as the level of functionality that the app provides a user in terms of pedagogical affordances (students can use MIM to ask lecturers or classmates for help to clarify something and social affordances (students use MIM to express feelings and concerns). On the other hand, usability is associated with how well the user can use the functionality of the MIM app to accomplish a task. Usability provides users with technological affordances; a MIM app can alert a student when a new message arrives, or the student responds to a message with a simple click.

Several authors (Nitza and Roman, 2016; Carpenter and Green, 2017; Tang and Hew, 2017; & Sun *et al.*, 2018) emphasize the importance of learning design to successfully use m-learning. Gachago and Cupido (2020) specifically caution against high-tech complex modes of delivery that automatically exclude some students due to factors, such as the availability of data and an upmarket smartphone, instead of designing simple remote teaching solutions that facilitate student access. Rowe (2020), advocates the following principles to guide the design of m-learning interventions: (i) Asynchronous communication over synchronous communication; (ii) privilege text and audio files over video files; (iii) low-tech over high-tech software; (iv) simplicity over complexity, and (v) flexibility is the key.

Student requirements when using Mobile Instant Messaging Apps

Tang and Hew (2017) adopted the framework that measured the online presence via MIM, which proposed three categories, namely the affective, interactive and cohesive responses. Through this framework, multiple indicators were generated and assigned through an iterative process. The affective responses characterize the expression of emotions and mood; interactive responses show evidence that people are connected and responding, and cohesive responses maintain a sense of group commitment. This has been one of the most cited frameworks in the literature when it comes to measuring social presence in virtual environments. Researchers have modified the original framework to suit various research contexts like video feedback (Thomas et al.,

2017), and MIM (Wang et al., 2016). This framework along with the design guidelines has been majorly followed and proved useful in the current paper.

Consistent with the view of Rowe (2020), Gachago and Cupido (2020) recommend seven design elements to meet specific student requirements during lockdown. These are (i) focus on understanding the problem; (ii) collaboration and recognizing the need for a variety of perspectives; (iii) empathy and co-creation; (iv) iterative design and short feedback loops; (v) making mistakes and challenging perfectionism; (vi) contextualised learning, community focus and engagement and (vii) flexibility of systems and reconsidering the structure of a course.

Concerning focus on understanding the problem, the authors explain that learning design always starts with a problem. In the context of this study, the national lockdown was the trigger event that resulted in severe consequences for students. From this perspective the problem identified was finding a way to continue teaching, knowing that students had several challenges (limited data, unsuitable devices, inter alia). The second design principle, 'collaboration', explains that it is imperative to gather as many perspectives, skills and competencies to respond to a problem as severe as teaching during national lockdown.

They argue that collaboration goes hand-in-hand with the fourth design principle which is 'empathy and co-creation'. They claim that a resolution to the problem caused by the COVID-19 pandemic would be impossible to find without intimate knowledge of the students. They proffer that making mistakes is inherent in learning design as this is how we learn and that by making mistakes learning takes place faster and academic progress can only take place if lecturers and students are vulnerable and comfortable with making mistakes. This leads to the sixth design principle which is 'contextualised teaching'. The authors claim that all the stakeholders in the process of teaching during lockdown must work together to find solutions that fit specific contexts, thereby making learning possible in trying circumstances. The final design principle is being 'flexible'. They advocate that flexibility is needed on all levels and national lockdown presents HE with opportunities to push boundaries, to leave no student behind and try approaches which would not have been considered previously.

Factors that have an impact on teaching and learning with Mobile Instant Messaging Apps

Research shows that there is emerging evidence that MIM apps have a significant potential to support the learning process and have major implications on pedagogies, allowing direct access to several online resources, more focus on student's creativity and responsibility towards one's learning (Willemse, 2015; Loo *et al.*, 2016). Marshall (2002) established that people remember 10% of what they read, 20% what they hear, 30% what they see and 50% what they hear and see. The advent of such MIM technologies which combine images, text and audio can make the percentage higher than 50%. Amry (2014) also demonstrated the effectiveness of WhatsApp social networking in comparison to face-to-face learning in the classroom.

Methodology

On 23 March 2020, the President of South Africa announced a nationwide lockdown, and an implication of this in HE was no 'face to face' teaching. On 30 April 2020, the Minister of Higher Education announced that South African universities would need to move to "*multi-modal remote learning systems including digital, analogue and physical delivery of learning materials in order to provide a reasonable level of academic support to all our students at all institutions in order to save the academic year*" (SAnews, 2020).

At the commencement of national lockdown in South Africa, several universities solicited student feedback (Shoba, 2020) to determine the difficulties that students were experiencing. The survey conducted at the UoT where this research took place confirmed that the institution's students experienced the same challenges, such as access to computers, laptops and advanced smartphones, which were highlighted on a national level. Ostensibly, the greatest challenge was students' access to data to continue the academic programme. Thus, following the Minister of Higher Education's announcement in April 2020 to "*leave no student behind*" (Parliamentary Monitoring Group 2020), two lecturers who are regarded as institutional e-learning champions from two different departments in the Faculty of Engineering and the Built Environment (FEBE) at the UoT devised a multimodal low-tech remote teaching approach which included the use of MIM apps. Seven specific guiding principles advanced by Gachago and Cupido (2020) were employed as 'essential design elements' during the development of the teaching approaches. One lecturer (Lecturer A) selected WhatsApp and the other (Lecturer B) used Telegram.

From May until August 2020 Lecturer A had designated time slots (consistent with the normal non-lockdown timetable) in which WhatsApp lessons were delivered. Lecturer A divided each chapter into two or three sessions (timetable allocated) and in each session posted screenshots of each slide of the MS PowerPoint presentations used in class and a voice note to go hand in hand to explain the screenshots. Class discussions on the learning resources then took place on WhatsApp. The purpose of using WhatsApp was the low data consumption and to provide widening access to all students.

Concurrently, from May until July 2020, Lecturer B used Telegram and subdivided each of the MS PowerPoint presentations that would have been used for face to face lectures into smaller 'bite-sized' presentations. The original MS PowerPoint presentations were stripped of all unnecessary pictures and a plain white background was used to improve legibility. On average, each MS PowerPoint presentation was converted into seven smaller presentations covering all the work included in a particular lesson. The smaller presentations were then converted into PDF documents and an accompanying voice note was recorded to explain each PDF document. Software was used to compress each PDF and voice note to ensure that the least amount of data would be used by the students who received these learning materials. The aim was to develop low data usage resources (between 0.1MB and 8MB) that could be communicated on a low-tech platform which could be part of a multimodal teaching strategy.

Data collection commenced in July 2020 with an online census survey (n=188, response rate 59%) which included open-ended survey questions to obtain an understanding of the students' perceptions of their experience with relevance to Gachago and Cupido's (2020) design guidelines for remote learning resources. Cronbach's alpha coefficient was used to ensure internal validity of the Likert scale data. Survey data were analysed using SPSS and descriptive statistical techniques (measures of central tendency) were used to explore the extent to which the guidelines adopted by the lecturers influenced the student experience. The open-ended survey questions were examined for recurring themes.

All students who completed the online survey were invited to participate in a focus group interview. Sixteen students responded and all were selected for qualitative data collection. The findings of quantitative data analysis provided the basis for the development of the qualitative data collection instrument. The qualitative data collection instrument was designed to collect data in four areas. These were (1) the challenges students experience because of lockdown conditions, (2) student requirements in terms of MIM apps, (3) the benefits and disadvantages of using MIM apps, and (4) areas for improvement when using MIM apps. These focus areas were derived from the conceptual framework of the study. A pre-interview briefing session was planned where the design guidelines were explained to the focus group. A focus group interview was conducted on 21 August 2020 (n=16). To eliminate bias and ensure the validity and reliability of research data, the interview was conducted by another lecturer from FEBE, who was not a lecturer of any of the students being interviewed. Interviews were transcribed, coded and thematically analysed. Ethical clearance for this study was granted through institutional channels.

Results And Discussion

Quantitative results

The quantitative results of this study indicate that in terms of the first design principle which is 'focus on understanding the problem', 88.1% of the students surveyed agreed that sufficient communication between lecturers and students took place. Moreover, this was perceived by students as an attempt by lecturers to understand their challenges as confirmed by the following response to an open-ended survey question "*The communication n* (sic) *how friendly some lectures are ... N* (sic) *the time they give us to complete our test and assignment is reasonable and they are able to accommodate students who are having problems with network and load-shedding and a big thank you to the notes delivered to us, they were helpful*".

Related to the second design principle which is 'collaboration and understanding a variety of perspectives', 82.2 % of the participants indicated that lecturers provided sufficient opportunities to collaborate and promote the understanding of different perspectives. Similarly, concerning the third design principle on 'empathy and co-creation', 79% of the participants agreed that the lecturers encouraged discussion and thereby facilitated co-creation. The MIM app discussions were grounded in empathy and mutual respect between lecturers and students. Regarding design principle 4 'making mistakes and challenging perfectionism' and design principle 5 'contextualised learning', 69% of the participants reported having an overall positive experience

despite some challenges. The following response to an open-ended survey question confirmed that contextualised learning took place *"The lecturer set the atmosphere and adjusted to the pace of the class. That allowed people to understand and catch up on recordings if they missed class"*.

Finally, concerning the seventh design principle referring to 'flexibility of systems', 82.7% of the students surveyed reported the flexibility afforded by using MIM apps was an advantage in terms of student learning and engagement. A complete table of quantitative findings advancing the student perceptions of the extent to which the design of MIM apps met the seven design principles is presented in Table 1.

Table 1: Student perception of extent to which design guidelines were met

Seven design guideline (principles)	Quantitative Findings Lecturer A	Quantitative Findings Lecturer B
Focus on understanding the problem	91.1%	85.1%
Collaboration and understanding a variety of perspectives	78.5%	85.9%
Empathy and co-creation	66.1%	92.2%
Making mistakes and challenging perfectionism	78.2%	60.5%
Contextualised learning	50.4%	88.7%
Iterative design and short feedback loops	65.3%	61.2%
Flexibility of systems	83.4%	82.0%

Qualitative results

The qualitative results of this study are presented as per the theoretical framework by Tang and Hew (2017), namely (1) student general perceptions on MIM apps for learning, (2) student requirements when using MIM apps and (3) factors that impacted teaching and students' learning with MIM apps.

General student perceptions of using Mobile Instant Messaging Apps for learning

Consistent with the framework and findings of Tang and Hew (2017), students found using MIM apps for learning to be user-friendly and cheaper than other methods, confirming 'utility' since they reported using the MIM app to ask the lecturer or classmates to clarify and explain concepts and they were able to engage with classmates in a more social context. Furthermore, they confirmed usability stating the MIM apps were simple to use and alerted them to messages.

However, some students reported being uncomfortable having to use a personal device for learning.

In general, it is deduced that the transition from face-to-face lectures to remote teaching was not easy for students, however, the use of MIM apps made it easier. No student said that s/he was not able to, or did not use the MIM app to learn, thus the MIM app is an appropriate and useful teaching and learning tool during lockdown.

Student requirements when using Mobile Instant Messaging Apps

The results of data analysis on student requirements found overlapping concerns and associations in terms of Gachago and Cupido's (2020) learning design elements and student requirements. The first design element 'focus on understanding the problem' leads to the sixth, third and seventh design elements, which are 'contextualised learning', 'collaboration' and 'flexibility of systems' respectively. We found that aside from the challenges of lack of data, connectivity problems, lack of suitable devices (smartphones), and inadequate learning environment, participants also highlighted load-shedding as a significant additional challenge. From the analysis of qualitative data, it is understood that the use of MIM apps ameliorates these challenges, since teaching and learning can take place asynchronously, thus mitigating the impact of restricted data, connectivity and load-shedding. Moreover, the simplistic nature of the design used to deliver course content (PDFs and voice notes) lends itself to being sufficiently low-tech to overcome the challenges associated with not having a high-end smartphone.

Students emphasized the critical importance of effective communication between lecturers and students to ensure academic success during the unsettling time caused by the lockdown and load-shedding conditions. A further deduction derived from the analysis of qualitative data is some students were able to empathise from a lecturer's perspective. One stated, "…*but I understood, like obviously with the lecturers as well, this is new to them, and so we had to find which one works best and eventually I got comfortable with the way that we were doing things".* A conclusion drawn from this is flexibility is a requirement of all stakeholders (lecturers and students) in the teaching and learning process during lockdown.

During data analysis, an association was made between design principle seven 'flexibility' and the fourth design principle 'iterative design and short feedback loops'. Through constant engagement and the active solicitation of feedback from students, lecturers were able to adjust the teaching practices when using a MIM app as they were required. This iterative design using short feedback loops brings to the fore the flexible nature of using a MIM app for teaching.

Finally, regarding the fifth design principle on 'making mistakes and challenging perfectionism', qualitative data analysis highlighted several mistakes that were made by lecturers during the process of teaching with MIM apps. One student mentioned, "*there wasn't really uniformity amongst our lecturers, so I don't know what their means of communication with one another".* Significantly, some students also reported feeling "*bombarded*" by the MIM app. During data analysis, it was also found that students did not elaborate on the quality of the content and usefulness in terms of their studies. This is a gap which requires further research.

Factors that have an impact on teaching and learning with Mobile Instant Messaging Apps

Positive factors

Students drew attention to several positive implications of using MIM apps, including simplicity, quick feedback, multimodal platforms, self-motivation, and time management, which aligns with the theoretical framework. Students advanced that despite not enjoying the initial transition period to MIM apps, being able to go over course material again was better for them. Significantly, one student reported that she was able to keep up with her studies and fulfil her other responsibilities of being an essential service worker and a mother because a MIM app was used. She added "...*it worked for me because at times I would miss classes but I was able to come back to the whole class, like and actually start from the beginning of the class and gradually I felt like I was in class again. It gave me the opportunity to grasp everything as it was from the lecturer".* Another significant finding was some students who were shy to participate in class felt more comfortable and participated more fully when using the MIM app. Although there was a consensus among all the students in the focus group that the MIM app is an interactive platform, some students admitted to not needing to participate to be able to understand and were able to "just *listen and learn*". A final positive factor which was highlighted with the use of the Telegram app specifically was privacy, as the Telegram app does not require students to share a mobile number to be part of a group.

Negative factors

Aligned with the findings of Gon and Rawekar (2017) our students reported that 'message flooding' is a negative factor when using a MIM app for teaching and learning. They expressed that it was difficult to concentrate while receiving so many MIM notifications, and some used the word "*mess*" when they described how they felt. Moreover, our data analysis confirmed connectivity, lack of data, inadequate smart devices, load-shedding and the initial transition from face to face to MIM apps were negative factors for student learning.

An unexpected negative factor that emerged from the analysis of qualitative data was the negative impact of the historical social environment of some students. Evidence of this is one student's explanation of her family's inability to fully support her learning during the lockdown period. She said, "*The fact that I had to move out of res and live with both of my parents is something completely different ... I wouldn't say that they didn't but I think they don't understand because especially as an African child with African parents, they would always use phrases like, you not the first person to go to university, we've all been through it and we know how stressful it is, whereas one [would still be expected] to do chores around the house".*

Recommendations

This study has not only broadened our theoretical understanding of the use of MIM apps for online teaching during lockdown due to COVID-19, but it has also highlighted several areas that need further exploration. While this study has presented descriptive results of the evaluation of students' perceptions of using a MIM app against Gachago and Cupido's (2020) seven design principles, it also highlighted factors that require further investigation. Ultimately our research suggests that MIM-supported communication will lead to higher levels of learning, particularly during unsettled periods such as lockdown. This study confirmed that MIM apps serve both a

utilitarian function in terms of pedagogy and classroom engagement and being extremely easy to use makes learning with MIM apps highly accessible. Understanding how different MIM technologies can have a pedagogical and social impact on learning presence and learning is a meaningful direction for researchers and educators to explore in the future, and thus a recommendation of this research.

At the time of data collection, two shortcomings were identified. Part-time and full-time students were not differentiated and students who used WhatsApp and those who used Telegram were not identified. Thus, when empirically examining student requirements it was not possible to explore themes along those categories. A further recommendation of this study is a more in-depth follow-up study to explore this.

Conclusion

The COVID-19 pandemic has undeniably changed aspects of the HE landscape in South Africa. While lockdown certainly constitutes a noteworthy challenge for all, it simultaneously presented us with a significant opportunity and a moment in time when we, as HE educators, were able to push boundaries, make changes, try out things we previously wanted to but did not have enough motivation until now. This paper has presented the findings of one such explorative study which showcased the use of MIM apps for learning while creating opportunities for connection, engagement and innovation. We found that the seven design principles presented the necessary guidance for us to provide good quality instruction from the beginning of the process, through the development, design, implementation, and finally when we performed an overall evaluation of our teaching intervention. Our research highlighted the most primary and substantial challenges associated with teaching with MIM apps and provided the direction for further research on using MIM apps for teaching.

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Student experiences of an unexpected online learning environment due to COVID-19: The case of St Joseph's Theological Institute NPC, South Africa

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Abstract

In South Africa, the COVID-19 pandemic has had palpable effects on the students in all higher education institutions (HEIs). Unavoidable and extraordinary online teaching and learning was experienced across HEIs. Catholic higher education institutions extraordinarily embarked on online teaching and learning from the usual didactic approaches to teaching. This was a sudden shift from a comfort zone. This reflective paper focuses on the undergraduate student experiences of the unexpected and extraordinary online teaching and learning at a Catholic higher education institution, St Joseph's Theological Institute (RF) NPC (SJTI), South Africa. The COVID-19 pandemic interrupted the normal didactic approach to teaching forcing this institution to go online and teach remotely. Direct quantitatively gathered responses from 120 students about their personal online learning experiences were evaluated. A reflective analysis suggests that although remote and online teaching and learning came unexpectedly for the Theological Institute's students, at SJTI the experience is generally positive. Experiences that the students expressed show that the setting which was normal for the didactic approach to teaching extraordinarily got disrupted by the COVID-19 pandemic situation shifting positively to virtual delivering of education. When compared to other public HEIs, the religious-based HEIs, in particular the Catholic higher education institutions like this case of St Joseph's Theological Institute (RF) NPC, were forced out of their normal comfort zones. Perhaps without the COVID-19 pandemic such institutions would not have had 1) new experiences and opportunities; 2) enhanced efforts towards thinking about designing quality digital pedagogies for their future.

Keywords: COVID-19, Higher Education Institutions, Online Teaching, Student Experience

Introduction

The COVID-19 pandemic has affected a number of people in different ways in South Africa. In higher education academics and students are groups of the people affected directly. By Mid-March of 2020 the unfolding global events of the COVID-19 pandemic had reached South Africa. The country's government, like all other governments of the world, on the 15th of March 2020 took a decision to implement a nationwide lockdown based on its national Disaster Management Act, 2002 (Act No. 57 of 2002) ("the Act " Section 27(1) and (2) of the Act)[7].   The COVID -19 outbreak was immediately declared "a national state of disaster". This is how the COVID-19

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[7] https://www.gov.za/sites/default/files/gcis_document/202003/43096gon313.pdf Accessed 2020/08/05

pandemic and enforced national lockdown caused disruption to all sectors including divisions of the higher education sector. Institutions, private and public, had to comply with the national lockdown regulations as stipulated in the Government Gazette, 15 March 2020. Putting it simply all sectors were forced to close shop. Eventually millions of university students were sent home because HEIs were undertaking "to deal with the Pandemic"[8] as a proactive response with stay-at-home, social distance and flatten the COVID-19 curve. St. Joseph's Theological Institute NPC[9], abbreviated as SJTI, falls within the division of the private higher education sector in South Africa.

SJTI is a Catholic higher education institution registered with the South African Department of Higher Education and Training since 2003[10]. The institution has operated as a Catholic theological institution for over 50 years and it is home to a compact cross-cultural community of over 250 students and over 40 academic and support staff members. As a cross cultural community, SJTI is a mixture of people from various African countries and other regions of the world largely housed in various male and female religious congregations within the Catholic Church. Operationally, SJTI exists as a key partner of an ecumenical cluster of theological institutions in Pietermaritzburg, South Africa, comprising of the School of Religion, Philosophy and Classics (UKZN), the Evangelical Seminary of Southern Africa, among others[11]. It offers four undergraduate degree qualifications, namely, the BA and B.Th. in Theology, the BA in Philosophy, and the BA in Human and Social Development[12]. Given the nature of tertiary level Catholic Theological Education and the needs of the ordained and non-ordained ministry within the Catholic Church, it is normal that SJTI uses didactic approaches to teaching and learning rather than distance and online methods. At the time the COVID-19 pandemic and national lockdown began SJTI was in full swing with its 2020 first semester academic programme and teaching. The declaring of the COVID-19 pandemic as a national state of disaster and then the enforcement of national lockdown disrupted the normal contact teaching and learning approaches typical of this Catholic theological institution.

SJTI is accredited mainly for contact teaching and learning. DHET directed institutions to come up with short to medium strategies "including online study"[13]. In keeping with the COVID-19 pandemic national lockdown regulations SJTI unexpectedly adapted to remote and online teaching and learning. It was unknown what this extraordinary adaptation could mean for their undergraduate student clientele. Was this a sudden take off into a new direction to arrive at the same intended destination? A sudden shift from didactic delivery methods to digital and virtual education was not an option for both academics and students. This widespread impact of the COVID-19 pandemic became a reality. The question then arises around the undergraduate students' physical and psychological experiences of this sudden pedagogic shift.

The purpose of this paper is to reflect on the undergraduate students' direct physical and psychological experiences of remote and online learning delivered in a theological higher

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[8] https://www.gov.za/sites/default/files/gcis_document/202003/43096gon313.pdf Accessed 2020/08/05

[9] https://sjti.ac.za/about-sjti/ Accessed 2020/08/05

[10] https://sjti.ac.za/about-sjti/ Accessed 2020/08/05

[11] https://sjti.ac.za/about-sjti/ Accessed 2020/08/05

[12] https://sjti.ac.za/about-sjti/ Accessed 2020/08/05

[13] https://www.gov.za/sites/default/files/gcis_documents/pset-Coronavirus.pdf

education institution using SJTI as a practical case for analysis. The research problem is that when extraordinary crises sanction a pedagogic shift forcing sudden adaptation to online and digital methods, institutions have no time to consider perceptions and experiences of undergraduate student cohorts to inform preparedness and content design and delivery methods. The assumption is, therefore, that experiences of the undergraduate students provide a good opportunity to theological HEIs in identifying the possible primary issues and problems. Institutions like SJTI can draw lessons from current adaptation to the new online education.

The paper contributes toward the understanding of the relevance this online teaching and learning has in Catholic theological higher education institutions beyond the COVID-19 pandemic lockdown. The interest is in the future of teaching, assessment and learning at the level of Catholic-based higher education institutions in South Africa and beyond. The analysis of the student experiences at SJTI provides a description and explanation about the possible future delivery methods of online teaching and learning. In Catholic theological higher education these approaches would not have been in sight had it not been for the COVID-19 pandemic lockdown crisis so this paper may also present a diagnostic view relevant to theological institutions. Two key broad aspects are covered in this paper: 1) Online teaching studies broadly – studies on online pedagogic efforts, lessons, challenges, and the future; 2) the understanding of the undergraduate students' direct physical and psychological experiences of the adapted online learning.

Literature

Internet of Learning in higher education

The delivery of online learning dates to the early 1970s which started with distance learning supported by computer usage. During the late 1990s there was a shift through the rapid development of the World Wide Web (WWW) (Brown 2010). This development of www impelled hopefulness resulting in the "learning technology [gaining] general acceptance" (Brown 2010). Hence, Brown (2010) argues that "it was in 1998 and 1999 that the Web truly began to influence strategic thinking throughout tertiary and higher education." This web was so disruptive in education that HEIs began to apply thinking processes to the integrating of web technologies into achieving set goals in educational endeavours. For this reason, learning began to be conducted by means of the Internet which then further facilitated virtual learning environments (VLEs), social networking sites (SNSs), and blended online and digital (BOLD) (Newland, Jenkins and Ringan, 2006; Hollyhead, Edwards and Holt, 2012; Ahmed, Zakaria and Elmi, 2012; Porter et al.. 2019).

Newland et al.. (2006) establish that in the UK higher education sector the adoption of Internet of Learning increased institutions' adaptation to virtual learning environments (VLEs). Teaching and learning were designed and delivered through online and digital technologies. However, for HEIs implementing VLEs disguised a range of issues at the institutional and individual academic staff levels. Newlad et al. (2006) focused on the issue of academic staff's personal experiences about integrated e-learning within their academic practice. Apparently, academic staff experiences played an important role in understanding better the adoption and integrating of e-learning and VLEs. In the UK HE sector, the relationship between academic practice and e-

learning had an influence in improving the student's learning experience. Hence, academic staff's personal experiences needed to be empirically examined.

The Internet of Learning further developed into students using social networking sites (SNSs). Educator-led and student-led forums within a VLE of a higher education institution (HEI) were used to study academic experiences and perceptions (Hollyhead et al.., 2012, p.369). The authors establish that "students' voluntary use of SNSs as a complement to formal learning is culturally embedded in the HEI and constitutes a widely accepted 'integral' part of the learning experience" (Hollyhead et al.., 2012, p.369). SNSs are one technology that makes e-learning possible. Academic staff experience several challenges with students using SNSs for e-learning to support the traditional and formal learning. One challenge established is that patterns in the students' use of SNSs conceal the learning materials and resources. Academic staff further experience difficulties that include the duty of care, furtive exchange of assessments and unhelpful criticism of HEIs (Hollyhead et al.., 2012, p.370). Thus, academics perceived in virtual learning communities the students' use of SNSs is more problematic than a balancing solution between e-learning and contact learning.

Ahmed et al.., (2012) assess the readiness of HEIs as VLEs. VLEs offer all kinds of online learner-lecturer interactions. Online teaching and learning takes place when the lecturers and the students are in different places but at the same time present to each other (Ahmed et al.., 2012). In this environment technologies have necessitated both the lecturers and students experiencing real-time presence and interaction in HEIs. Brown (2010) examines VLEs as interactive learning settings. Therefore, if HEIs are to successfully adopt and implement VLE systems in the teaching environment the lecturers and students should be knowledgeable about digital technologies. Thus, "face to face education increases contact time with learners" which is opposite to e-learning (Ahmed et al.. 2012, p.86). While face-to-face contact is minimal, digital technologies enhance students' thinking and making contributions fast (Ahmed et al.., 2012, p.86). Accordingly, in higher education e-learning continues to be entrenched in institutions influencing the future directions in pedagogy (Brown, 2010). In these virtual learning communities, the next generation of academics and students embrace the use of innovative teaching and learning digital technologies. The Internet of Learning was long predicted as the future in the higher education sector and HEIs.

Academic Staff Experiences

Green and Myatt (2011, p.33) conducted a narrative research study on the experiences and perceptions of new international university academic staff in Australia. Their finding entails academic staff facing difficulties including personal costs in the form of emotional culture loss as one gets exposed to a new cultural environment. However, institutions had to face changing cultures of learning (Green and Myatt, 2011, p.33). Over time these issues were resolved by HEIs focusing on the quality of teaching, student learning and research. In the section above in this paper, a study by Hollyhead et al.. (2012) discovered that academic staff experience the challenges with students using SNSs for e-learning. The difficulty is that unlike in traditional and formal learning, in e-learning and in the use of SNSs the learning materials tend to be hidden. The experiences place the importance of awareness by HEIs about the Academics' personal and emotional difficulties that come with new teaching and learning environments. When it comes

to online education Rodger, Turpin, and O'Brien (2015) then suggest a way of thinking through curriculum change. This is a practice that combines threshold principles with the specific use and assessment of reflective activities. Thus, at the beginning of a new learning environment threshold principles must be merged with reflective activities to achieve learning outcomes. This requires planning.

According to Gill (2019) the online learning social aspects and interaction can be understood through planning, initial reflection and developing understanding. These are categories used as a phenomenographic approach to qualitatively investigate and analyse the perspectives and experiences of new academic workers in the online postgraduate education environment. In this environment employing new academics requires a deeper understanding of the cohort's needs for professional growth, including the way they think and apply themselves to the environment.

Three forms of variation Gill (2019) established are the perceived role of the teacher, the teacher's perception of the online environment and the nature of teacher-student interactions. These differences have implications for growing numbers of new academic staff who are involved in the preparation and implementation of online postgraduate education. When starting to teach online for the first time what is likely to be overlooked by the new academics? While the answer to this observation remains hidden, however, the interesting finding is that the conceptualisation of online postgraduate teaching gives a more nuanced picture that will be of value to both those involved in online education and those supporting their development (Gill, 2019). Thus, in online postgraduate teaching academic development should include "teacher agency and empowerment rather than the delivery of packages of decontextualized skills and information" (Gill, 2019). Academic development interventions should be supportive in terms of "adequate time and space for reflection to allow educators to successfully undertake this new and evolving role" (Gill, 2019). Drawing from this conclusion the effects of the COVID-19 pandemic could not have given HEIs such academic development intervention leeway. Academics, new and old were affected in different ways. The same can be suspected for different levels of students in their different contexts and communities of higher education institutions.

Torrisi-Steele and Davis (2000) studied the experiences of academics in Australian universities. Scholars see that universities in this country have improved their attention to flexible online delivery of learning (Torrisi-Steele and Davis, 2000). Two important elements in designing online curricula and teaching material are that academics must have, firstly, knowledge of pedagogy as it applies to multimedia technologies and, secondly, knowledge of the capabilities of current software and hardware (Torrisi-Steele and Davis, 2000). Clearly, academics are prepared and are aware of skills and approaches that apply to the traditional contact teaching environments, but there is unpreparedness for the new demands of online pedagogies and technologies (Torrisi-Steele and Davis, 2000). Torrisi-Steele and Davis (2000) conclude, therefore, that "the potential of the online learning environment to improve the quality of the learning experience often remains unreleased".

The experiences of academics about online teaching environments are driven by teaching new network technologies and computer programmers. This environment requires academic development of teachers to enhance flexible learning. Torrisi-Steele and Davis (2000) have the example of Griffith University which developed campus-based production centres and

multimedia development teams to support their academics with designing and integrating online course materials and resources. In HEIs lecturer educational development should directly address academic staff expectations, experiences, and perceptions to meet the concern for the quality of online teaching and learning. Porter et al.. (2019) in the study on nursing academics' experience of blended online and digital teaching and learning found that firstly "academic staff (require) to be genuinely prepared, educated, guided and supported to understand the pedagogy of BOLD"; secondly, staff require to "manage content and delivery for both face-to-face and online student cohorts within the learning platform"; and thirdly, staff need "a recognition of the need for ongoing evaluation across the implementation". Thus, key to successful and quality blended online and digital teaching and learning for academic staff are preparation and preparedness, content management and delivery, and ongoing monitoring and evaluation. Therefore, discourses on academic staff expectations, experiences, and perceptions should concern themselves with preparedness, content management and delivery, and ongoing monitoring and evaluation of online and digital teaching and learning. If this is important from the academic staff perspectives, what about the students?

Experiences of Students

In analysing the educational system of delivering teaching and learning any method, sampling the students and investigating their experiences and perceptions is crucial (Bovill, Cook-Sather & Felten, 2011, p.133). Thus, HEIs design approaches and methods of delivering learning- teaching methods, courses and curricula around their students. Bovill et al. (2011, p.134) argue that HEIs when designing processes have often ignored the role played by student perspectives. Instead, the design processes of pedagogic preparation should involve the students as key partners (Bovill et al., 2011).

Bowers and Kumar (2015, p.24) conducted a comparative analysis of both the contact and online teaching and learning environments. Many HEIs have adapted the online learning environment making it part of their overall strategy (Bowers and Kumar, 2015, p.24). Bowers and Kumar (2015, p.24) posit that while this explosive growth has created exciting opportunities for both institutions and students, however, in online learning environments the high student dropout rates could not go unnoticed. Seemingly, a catalytic factor in student attrition in online courses is a lack of social and teacher presence; that is, the absence of "face-to-face contact" (Bowers and Kumar, 2015, p.24). The stronger the "teacher and social presence" in the contact learning environment the better the physical and psychological experiences students have (Bowers and Kumar, 2015, p.24). Online environments in education should be observed and understood from this student perspective. Such is the knowledge gap for the South African context of higher education institutions. This paper is, therefore, concerned with the physical and psychological student experiences from the sudden adaptation to online teaching as sanctioned by the COVID-19 pandemic crisis in 2020.

Researchers have widely analysed academics' and students' feelings, perceptions and direct experiences about the intentionally adopted VLEs, e-learning and online environments in HEIs. Studies have found that in online learning environments the experience and sense of lack in social and teacher presence influence the students' overall negative perceptions of teaching and learning in HEIs (Capra, 2011; Rovai and Wighting; Trello, 2007). As a result, those students who

perceive a lack of social interaction and teacher presence are more likely to withdraw and/or fail their higher education studies (Capra, 2011; Rovai and Wighting; Trello, 2007). However, some studies are showing that there are students that manage to persist and adapt to this learning environment by developing other forms of sense of connectedness and presences (Hart, 2012; Ivankova and Stick, 2005). Literature further shows that globally when many HEIs adapt purposefully the online teaching and learning experiences are somewhat positive. However, issues around isolation and disconnectedness as experienced by students in online courses remain crucial. This social teacher seclusion reality leading to unavoidable student attrition in online courses relates to the problem of an institution that finds itself forced to be a VLE, like SJTI (Bolinger and Inan, 2012; Rovai and Wighting, 2005; Trello, 2007).

The experience of the COVID-19 pandemic crisis in 2020 is like no other. The distance between lecturers and students created by the sudden online methods in delivering courses may have created physical and psychological alienation and disconnectedness in learning. Unlike the traditional contact courses, for students' experience everything is new, and the delivery of online learning material and content management may be unfriendly. Students are disengaged from peer educational activities and ongoing assessment activities.

Methodology

One hundred and twenty student respondents at the St Joseph's Theological Institute NPC participated in one quantitative baseline study carried out by the Dean's Office. The Dean's Office conducted a baseline survey to assess how learning experience has been for the students during the COVID-19 pandemic and nationwide locked down in South Africa when contact lectures are being replaced with online teaching. The purpose of this survey was to get responses that would assist the Institute in its effort and determination to provide quality remote teaching and learning. Drawing from this baseline survey data, this paper then adopted an archival research design. Data already collected from the baseline approach and from survey questionnaires distributed to 259 students constituted existing documentation at SJTI. In this paper, these survey data obtained from the Dean's Office are the primary sources and have been extracted and assessed for analysis. The reason for choosing this design is that these data sets were a special collection which is deeply specific to the COVID-19 pandemic and lockdown areas and relevant to the SJTI and Catholic theological education context. Descriptive analysis technique was appropriate for the datasets that were collected without defined research objectives and questions typical of academic writing. The technique was set up and used to identify, understand and explain the students' experiences of distance and online teaching and learning. Results inform explanation about the future and progress in remote and online teaching and learning at the institute. The results were further analysed for simple differences between the two groups, namely, the agreeing group and the disagreeing group. The aim was to try and predict the most consistent explanation for the expressed learning experiences about online teaching at the SJTI.

Presentation of Results

Response rates

Distributed survey questionnaires	Returned Completed Questionnaires	Response Rate
259	120	46,33%

Devices, Internet access and E-Learning platforms
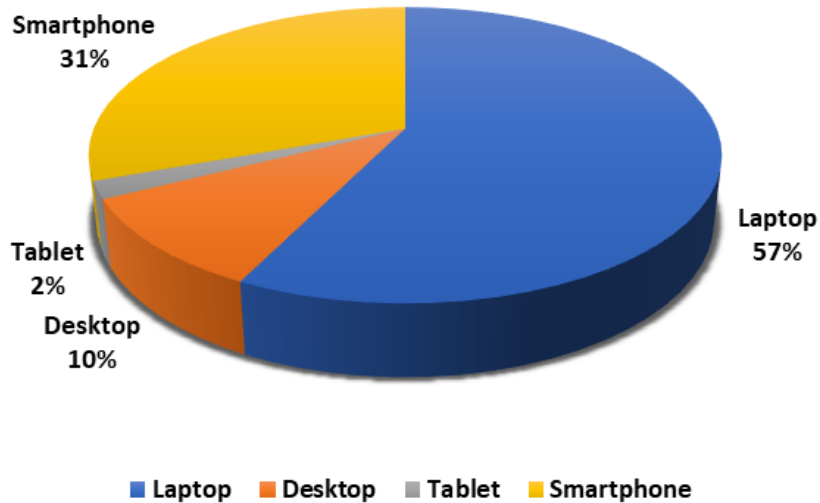
Figure 1 Student device

Figure 1 presents the learning technology devices students used during the online teaching and learning. Laptops and smartphones dominate with 88%.
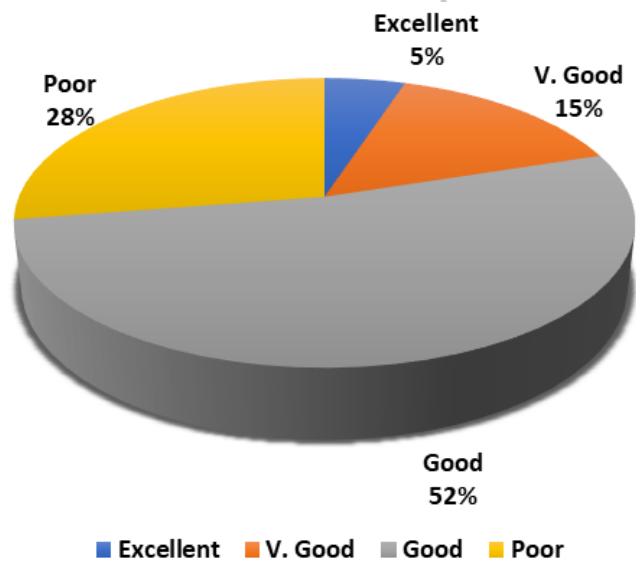
Figure 2 Internet access and connectivity

Figure 2 presents the internet connectivity on a daily basis during learning. 52% find it good and standard.
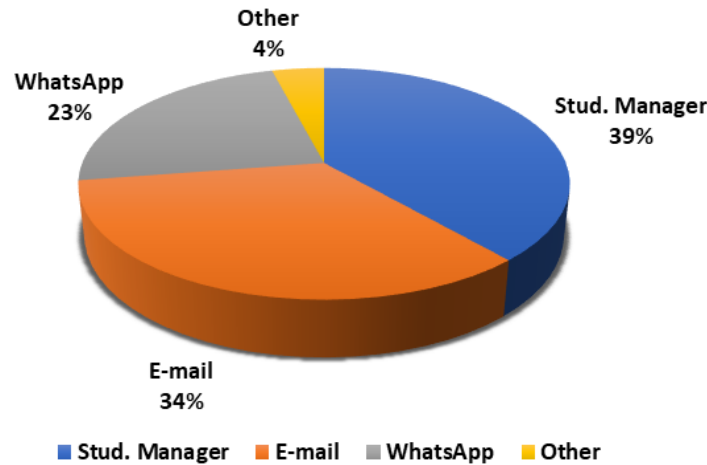
Figure 3 E-Learning platforms

Figure 3 presents the e-Learning platforms accessible to the students and through which the students received and accessed the learning materials. Student Manager and email are accessed by 39% and 34 % of students, respectively. 23% have had WhatsApp used for accessing learning materials.
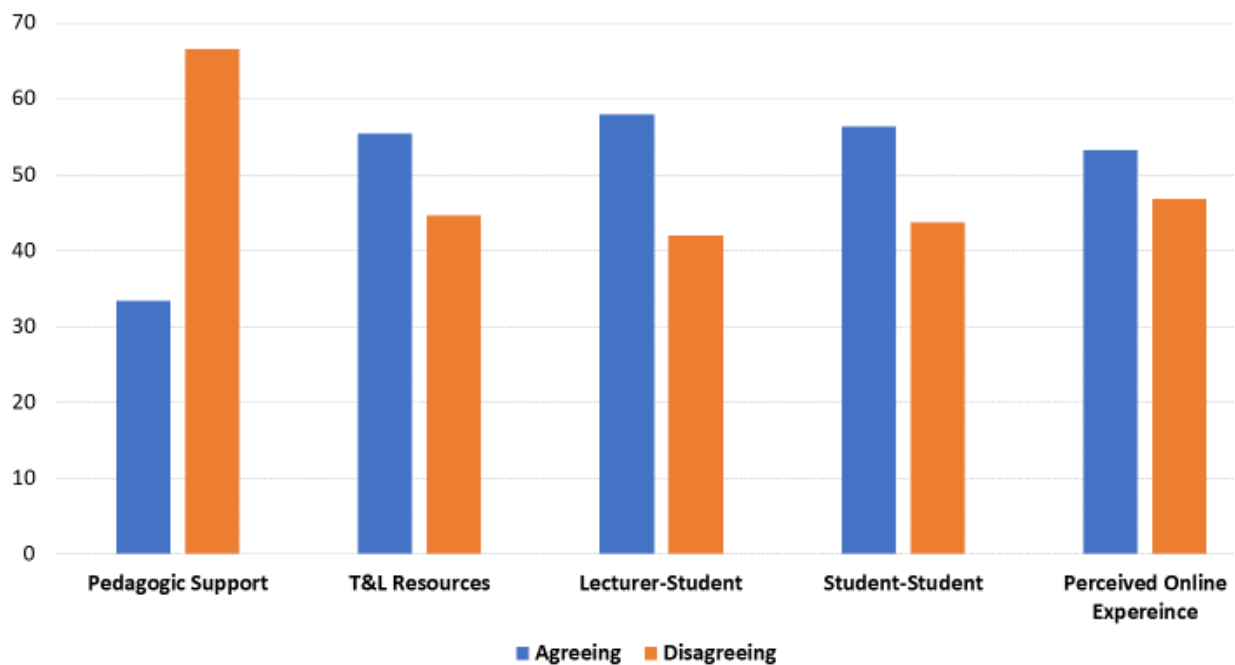
Figure 4 Experience of online teaching and learning

Pedagogic Support 33,4% agreed and 66,6% disagreed to have had:

- Access to lecture notes, assessments, lecturer feedback and tutorials, and Group discussions during the lockdown period.
- Reading material, assignments and other resources provided in line with the stated NSH of their modules.
- The workloads proposed for each module considered the change in teaching and learning modality.
- Lecturers' approach to online delivery was challenging but encouraged learning, flexibility, adaptability and engagement.

Difference between the two groups -33,2% favours the disagreeing group.

Overall Teaching and Learning Resources 55,4% agreed and 44,6% disagreed to the fact that:

- The online learning was mainly supported by internet sources.
- Lecturers made available scanned copies or print sources via the Student Manager (e-learning) and e-mail addresses.

Difference between the two groups 10,2 % favours the agreeing group.

Lecturer-Student interaction 58% agreed and 42% disagreed to the fact that:

- Lecturers were available to attend the students' concerns.
- Class representatives played a great role as link-persons between the classes and lecturers, thus, keeping the students informed of any communication made by the lecturer including the uploaded reading material, formative assessment, etc.

Difference between the two groups 16% favours the agreeing group.

Student-student interaction 56,3% agree 43,7% disagree to the fact that:

- Mutual support and solidarity among students provided a great help because there were exchanges of learning resources via e-mails, WhatsApp, etc.
- Group discussions were a great help during the period of lockdown.

Difference between the two groups 12,6% favours the agreeing group

Student perceived online experience 53,2% agree and 46,8% disagree to the fact that:

- Online learning provides an opportunity to be creative and active in organising and managing time for self-study.
- Distance learning is a better solution during this period of disruption and guarantees the continuity of the academic programme.
- Given the possible continuation of the COVID-19 crisis, the online learning experience laid a foundation to proceed into the second semester using this similar modality of learning and teaching with no contact lectures.
- They were able to post questions on Student Manager and sought clarification by interacting with their lecturers and peers.

- Online learning keeps one busy and helps reduce the stress that the lockdown is likely to weigh heavily on robust young men and women.

Difference between the two groups 6,4% favours the agreeing group.

Findings

Students' experiences of online teaching and learning during COVID-19 pandemic lockdown reflect:

- The dominance of Laptops and smart phones among students.
- Seemingly bearable but ordinary internet connectivity daily during learning.
- Apparently acceptable access to e-Learning platforms.
- The borderline between what is perceived as a friendly or unpleasant environment.

Reflection

According to Bennett, Priest and Macpherson (1999, p.207) there is "a belief that the use of new technologies for course delivery will, in itself, attract students". The finding in this study shows that the majority of SJTI students own and use personal laptops in addition to smartphones for learning during the lockdown. These gadgets are not merely a source of attraction for online learning but rather serve as necessary tools for new digital educational technologies. Modern digital technology devices – supercomputer and computing – foster effectiveness and efficiency in online teaching and learning. But the finding of this paper echoes that ascendancy in students owning and relying on personal devices echoes that SJTI has an opportunity to implement student-centred approaches to learning (Bennett et al., 1999, p.208). Thus, the sudden adapting to online education in the first semester owes its success to the new technologies. The online and distance lecture materials were produced and delivered electronically. If students did not have access to the new technologies, it would have taken longer to switch quickly from contact to implementing an online and digital approach. New technologies in online education work together with reliable internet connectivity.

The delivery of online education generally requires that HEIs ensure that students have access to the internet. The new educational digital technologies must be paralleled with existing area internet connectivity broadband. The finding in this study shows a seemingly bearable but ordinary internet connectivity for the SJTI student daily during learning. The experienced internet connectivity is debatable: while the first finding confirms SJTI students having access to computer hardware necessary for online learning, there is more that needs to be scrutinized about connectivity in relation to teaching and learning interactions. Bennett et al. (1999, p.209) established that the internet is limiting for online and distance students. The connectivity issues limit students' interactions with lecturers, other students and extra resources. The internet costs shift from the institution to the student. Now, these restrictions are factors in students suffering "academic and social isolation" and eventually dropping out of their studies (Bennett et al., 1999, p.209). However, some positivity with the internet includes the student's personal development. Bennett et al., (1999, p.209) posit the internet offers the students several opportunities: interaction with administration, access to a wide range of learning materials through electronic resources and development of internet technology specific skills. Bennett et al., (1999, p.209)

argue that "whatever the strengths and failings of online pedagogies, the still evolving technology of computers, modems and ISPs means that studying online may be at times very frustrating: viruses, unstable software, incompatibility problems, and slow access times [are the] difficulties [which] may effectively counter the flexibility provided by online delivery". This means that SJTI should take internet connectivity seriously and the fact that students may encounter frustrations with online teaching and learning.

The online learning environment is shaped by e-learning platforms. The finding in this study shows the students perceive acceptable access to e-Learning platforms at SJTI. This experience can be referred to as "an opportunity for students to engage in highly interactive communication with the instructor and their peers" (Bolliger and Wasilik, 2009). This may mean students may be feeling some sense of satisfaction and link this to their supported student performance. Thus, the e-Learning platforms SJTI exposed the students to are supporting and enhancing student performance. This could be an interesting journey to using educational technologies and internet technologies at the same time.

According to Bolliger and Wasilik (2009, p.104) the way students discern their online learning experiences stems from how they understand their educational value at a higher education institution. This simply describes the students' level of satisfaction. The study reflects that 53,2% of students at SJTI interpret semester I of 2020 online teaching and learning to have allowed them creative opportunities in organising and managing self-study times, a continuity of the academic programme, a foundation to proceed into semester II, and interaction with their lecturers and peers. 46,8% understood semester I of 2020 online teaching and learning differently. This result is marginal as some students perceive the online learning experience as almost borderline between what is discerned as friendly and what is understood as an unpleasant environment. This marginal online learning experience of students may draw from two conflicting angles of influence to student satisfaction in the online learning environment: harmonizing continuous learning, and disruptive learning.

Harmonizing continuous learning: SJTI students experienced the online teaching and learning as bringing continuous support of self-study, the academic programme, readiness for online semester II learning, and lecturer-student and student-student relationship. This interpretation confirms the insight of Bolliger and Wasilik (2009, p.105) about bringing together the lecturer, new technologies (including the internet), interactivity; communication, use of course management systems, students' understanding of task value and self-efficacy, social ability, quality of system and multimedia instruction.

Disruptive learning: there are students who view and understand online learning as life in a bubble that is an unsettling learning environment. This perception relates to Bolliger and Wasilik's (2009, p.105) understanding of online learning limitations, among them "administrative issues, social interaction, academic and technical skills, motivation, time, limited access to resources, and technical difficulties ... unfamiliar roles and responsibilities, delays in feedback from instructors, limited technical assistance, high degrees of technology dependence, and low student performance and satisfaction".

Reviewed literature reflects that successful and quality blended online and digital teaching and learning requires preparedness, content management and delivery, and ongoing monitoring and evaluation (Porter et al., 2019). Even though results from the student survey do not mirror these elements, however, the pedagogic support result shows a difference of -33,2% that favours the respondents who disagree. Another result to take note of is with regards to students' perceived online experiences which shows a difference of +6.4% between respondents who agree and those who disagree. The way the students understand pedagogic support and their general online learning experience could be an indicator of the institution's preparedness, content management and delivery, and ongoing monitoring and evaluation during this COVID-19 pandemic crises and lockdown.

In an effort to contain the COVID-19 pandemic crisis, save the semester and academic programme, there was no time for SJTI as an institution to prepare staff and students for e-learning. The institution was faced with the question of whether to save the first semester academic calendar or to abandon it altogether. The solution was then to adopt a practical approach shifting to digital teaching and learning in response to the COVID-19 pandemic crisis and lockdown regulations.

Conclusion

Contact pedagogy is deeply rooted in Catholic theological education culture and the needs of the ordained and non-ordained ministry within the Catholic Church. For the SJTI students and staff this didactic approach to teaching and learning is the *alma mater*. This culture of learning is driven by face-to-face contact teaching. Remote and e-learning are a new place and culture. The results in this paper reflect SJTI as a potential VLE which the students experienced based on continuous learning, content management and delivery. This is confirmed by the findings. The physical experience is that students increased the knowledge and the use of Laptops and smart phones for learning and became increasingly aware of the role of internet connectivity in teaching and learning. The students understand that in an online environment content management and delivery intend to break away from the established model and culture of contact learning in a Catholic theological education. Psychologically, the students understand and accept the intensity of e-Learning platforms. In addition, the students feel the online and remote environment confuses the way they think and apply themselves to learning. This environment is disruptive to Catholic theological education - conflicting between being friendly and being unpleasant. SJTI must therefore take into consideration sentiments by students who feel going online was disruptive to education. Feasibly, without the COVID-19 pandemic SJTI would not have had an opportunity to test this potential and efforts in thinking about designing quality blended online and digital pedagogies for their future as an HEI in South Africa. The future of SJTI is likely to be the hands of the next generation of academics and students who can embrace the use of innovative and digital teaching and learning technologies.

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A conceptual framework for a reformed curriculum design to teach business processes adopting Experiential Learning through the use of game simulation

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Abstract

Teaching business processes and the challenge it carries with traditional teaching and learning methods with content- focused curriculum design, has been given recognition in the literature. Thus, this paper aims to demonstrate the use game simulation adopting experiential learning for a reformed curriculum design to teach business processes, using block design principles can improve student engagement and facilitates to provide structured feedback processes in the learning activities. Utilising transition pedagogy in the application of this reformed curriculum, means enhancing student learning through formative assessment via feed forward practice to comprehend students' learning needs and their academic progress throughout. This reformed curriculum design aims to teach business processes within an Enterprise Resource Planning Systems concept, to students who have little or no experience of dealing with business processes and enterprise integration. The proposed learning activities adopted experiential curriculum model thus using the ERPsim Game simulation, and also assessments to be adopted that constructively aligns with the course and the unit itself. Finally, the implementation strategy primarily revolves around the block design principles. This is where clearly all the listed learning activities have clear beginnings with debrief of intended learning outcomes and conclusions, through experiential activities (ERPsim simulation games) that enhances active learning, clear peer feedback is expected through adopting feed-forward practices and used in the development of the assessment tasks.

Keywords: Business Processes, ERP, Curriculum Reform, Block Design, Backward Design, Experiential Curriculum Model

Introduction

In every business, processes are an integral role to be managed and the consecutive cross-functional tasks to be understood is an expectation from a business scholar. To amalgamate the business market and expectations from a business scholar, poses challenges in feeding the right skills and knowledge within traditional content-focused curriculum. In addition, to teach business processes within Enterprise Resource Planning Systems (ERP) to students who have little or no experiences in business processes, adds to this challenge as to what extent of learning outcomes

stated within the curriculum is grasped by these students. There are many software available to teach business processes within ERP, however the lack of experience in working with an ERP software and understanding its complexity of enterprise integration by a graduate business student, begs the question "Can we not have a real- life experience using these ERP software?". In other words, teach students how to run ERP in a business environment and not give lectures on businesses running ERP.

This paper reports on the initiative taken by an Australian academic institution within the college of business, to develop a conceptual framework for a reformed curriculum design to teach business processes by adopting Experiential Learning through the use of Game Simulation.

Literature Review

In an organisation, different functional units are present and interaction between these different functional units utilising defined business processes is vital (Malone et al., 2003) and according to Gartner Research (2006) it is an important factor for a business sustainability. Businesses have invested money, time, and labour into product & service quality through process re-engineering and aims to sustain integration between processes, to achieve exponential growth in profitability (Hammer, 2007). This process integration that allows each functional unit to share information to perform an objective task, is an important skill to be learned and acquired by graduates (Quinn et al., 2003). The pedagogy skills to help students to comprehend the deep understanding of enterprise integration between departments such as sales, production, procurement is faced with challenges (Mortais et al., 2006) in addition to the complexity of ERP system software. Therefore, a sound curriculum is a must to allow graduate students with little or no experience in business processes and enterprise integration, to grasp its full understanding on linking information, processes and decisions to be made by management (Hawking et al., 2004).

Curriculum Design: Experiential Learning

For the purpose of this paper, a reformed curriculum means using Experiential Curriculum model. This is to align with course outcomes, to be able to transform assessments in higher education and achieve student engagement and retention in higher education, in turn aligns with the unit level outcome and intended learning outcomes for each learning activity using the block design principles.

A curriculum model considered in the curriculum reform will be Experiential Curriculum model, which is a problem-based approach with the possibility of most of the teaching tools such as lectures, research based tutorials to be discarded and adopting a learning environment where experiences are recorded and evaluated on each session (with the intention to apply transition pedagogy), adopted through block design principles (Arnett, Cannon & Kitchel, 2011).

A tool for evaluation will be used by the teachers to give valuable feedback (with intention to apply transition pedagogy) based on each simulated real-life case-based scenario and towards the students finding solutions to the problems. This in turn allows students to develop critical

thinking, reflection, and actively engaging in posing questions, investigating, experimenting, solving problems and constructing meaning (constructivism) (Ruhi, 2016), which all in accordance to the keywords used in Australian Qualifications Framework (AQF) level 9 (Cleary & Samarawickrema, 2014).

The aim is to increase students' knowledge about ERP in its curriculum, to reflect real-life work practices within Enterprise Resource Planning Systems, rather than just focusing on ERP software. At a curriculum design level, to target the learning objectives, learning activities were modified, taking into consideration the block design principles. Using block design principles means the learning activities are carried out from session 1 to session 11, that is conducting 3 hours per day for three days per week. The purpose of these learning activities is also to act as scaffolding towards completing summative assessments such as the group Assessment task 2 to be submitted at the end of session 9 as shown in Table 1. The learning activities scaffolding towards summative assessments is demonstrated by these outlined steps that utilises the use of ERPsim game simulation: -

In each session as shown in Table 1 relevant case studies will be de-briefed. Associated ERP simulation games and group role-play exercises will be undertaken, about different business processes, and these will be utilised in the summative assessments 1 and 2 due on session 7 and 9 (see Table 1).

Table 1: List learning activities and assessment tasks (recommended learning activities based on block design principles to maintain the relevance and currency in ERP current market)

	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	Session 9	Session 10	Session 11
Topic											
Learning Activities	Group role- play exercise with a debrief and students in groups play a role to do an exercise in order to understand about business process in an ERP setting.	Based on session 1 group role-play exercise, the groups will be provided a table with list of questions to address the Intended learning objective (ILO) of session 1. To answer textbook can be used and work in group setting.	The ILO in session 3, to debrief on understanding ERP role in cross-functional business processes. A role play exercise will be used to address this ILO.	The ILO is to debrief on procurement process and student form group to play a simulation game of ERPsim on procurement. Students in a group setting answers a list question referencing to textbook and simulation game and present answers with explanations	The ILO is to debrief on sales and distribution process and student form group to play a simulation game of ERPsim on sales and distribution. Students in a group setting answers a list question referencing to textbook and simulation game and present answers with explanations	The ILO is to debrief on production process and student form group to play a simulation game of ERPsim on production. Students in a group setting answers a list question referencing to textbook and simulation game and present answers with explanations	The ILO is to brief on various vendor solution on ERP and in group setting to play role as ERP consultant. Varied case scenarios (both local and global settings) given along with supportive materials to find solutions for these ERP business challenges, faced by the clients. Group can present answers/recommendations and justify it.	THIS IS ONLY A PLAN. SESSION 1-7 ONLY.	THIS IS ONLY A PLAN. SESSION 1-7 ONLY.	THIS IS ONLY A PLAN. SESSION 1-7 ONLY.	THIS IS ONLY A PLAN. SESSION 1-7 ONLY
Assessment Task				End of this game, marks will be allocated	End of this game, marks will be allocated	End of this game, marks will be allocated			Students in a group setting delivering their investigation into a current ERP topic and presenting(its findings	Individual students will submit a list of completed practical tasks, providing solutions for the given ERP business case scenario	Oral quiz- students in a specific business role as ERP consultant and to provide solutions/recommendations to a business ERP) challenge either for a local or global setting

In each of these sessions, students are strongly encouraged to take notes of these simulation games/ group role-play exercises based on a list of questions provided, that is the formative assessment. The answers sometimes will be articulated to the class by the group leader or will be posted to Feedback Fruits for students to do peer evaluations. Healthy discussions are expected and to receive peer feedback from classmates and constructive feedback from the teacher (adopting feed-forward practice). The feed-forward method allows students to showcase

their talent and act on improvements right away from the what-if scenarios provided by the teacher or fellow students in the class (Hirsch, 2017).

Using the list of questions and its answers/ feedback provided for each simulation /group role-play exercises from session 1 to 7 (adopting feed-forward practice), students are then gradually guided towards the summative assessment tasks 1 and 2 to be completed at the end of session 7 and 9 respectively.

Taking into consideration the brief discussion on the modified learning activities as above, the next section will discuss on the game simulation initiative of this curriculum design

Game Simulation

This reformed curriculum allows learning activities to adopt experiential learning through the use of game simulation. The game simulation chosen to be played in these learning activities is ERPsim, that teaches to apply the learned content to execute the relevant processes. This ERPsim game simulation has three rounds, each round takes 20 minutes to strategise among the group of 4 to play.

Real-time Game Simulation Timeline

For round 1, this will begin with students in a group of four allocated to specific teams such as Team A, Team B, Team C and so on. Each team will be given a logon username and password along with a client number (in this case client number 910 was used) to access the server through the use of SAP Logon 7.50. In this game, each minute is equivalent to 1 day. Each round taking 20 minutes to play means in the virtual world it is 20 days.

As shown in Figure 1, in this round each team is recommended to stop evaluation and strategise with the team on the seventh day. For round 1, each team is expected to apply the appropriate marketing expenses and apply appropriate prices for the products to be sold in the near future. Each team can strategise based on the reports available to them such as the sales order report, summary sales report and price market report. On the day 20, it will be the end of round 1, and the teams will be ranked as shown in Figure 2. At the end of round 1 after the ranking of the teams, time will be given for the teams to self-reflect based on the following questions such as: did your marketing work? Did your pricing work? and more, as shown in Figure 1.

Figure 1: Game simulation timeline

Team	Credit Ratings	Interest Rate (%)	Rank	Company Valuation	Cumulative Net Income	Total Sales	Gross Margin (%)	Net Margin (%)	ROE (%)	ROA (%)	D/E (%)	Mktg/S (%)	Round Net Income	Round Sales per Team
A	AAA+	6.000	2	698,883.60	17,472.09	345,356.20	5.059	5.059	3.376	3.335	1.236	0.000	1,578.13	90,740.04
B	AAA+	6.000	4	300,653.60	7,516.34	332,707.48	2.259	2.259	1.481	1.461	1.392	0.000	2,724.13	132,214.36
C	AAA+	6.000	5	89,362.00	2,234.05	966,751.55	0.508	0.231	0.445	0.328	35.768	0.009	(580.50)	292,246.23
D	AAA+	6.000	7	(5,938,326.00)	(148,458.15)	332,428.30	5.379	(44.659)	(42.231)	(39.238)	7.627	49.921	(60,478.35)	116,503.70
E	AAA+	6.000	6	(174,629.20)	(4,365.73)	435,408.27	(1.003)	(1.003)	(0.881)	(0.831)	5.997	0.000	(2,627.27)	153,655.70
F	AAA+	6.000	3	322,150.40	8,053.76	195,636.32	4.163	4.117	1.585	1.215	30.442	0.046	1,094.85	47,155.10
G	AAA+	6.000	1	839,823.60	20,995.59	432,612.19	5.348	4.853	4.030	3.277	22.964	0.000	2,849.80	255,767.10

Figure 2: Ranking of teams in round 1

Round 2 and 3 follows the same simulation timeline as round 1 but focuses on different processes. For round 2, the teams are expected to do the procurement process and for round 3 they have to do the material planning (see Figure 3)
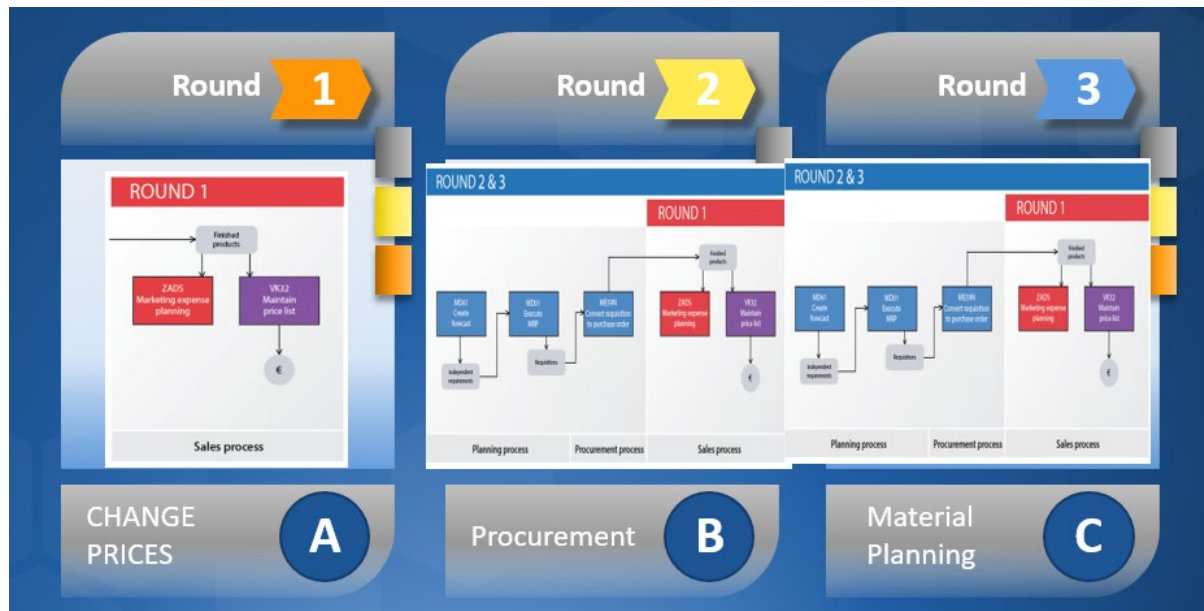
Figure 3: Processes to undertake in round 1,2 and 3

Outcome and Conclusion

This game simulation has only been run for one semester, and the verbal responses and verbal feedback from students has been encouraging. Students who have always given excuses to participate in group assignments, are now showing strong enthusiasm in willingness to participate, in this game simulations to work in teams. This real-time game simulation has increased the student competitiveness, teams have approached to say if they had known they were also competing other classes and not just theirs, they would have worked harder, this goes to show how much effort students are capable of making given the right learning and motivating environment. The weakest students had outperformed other students- a group of students who needed extra class to learn how to do their workshop activities (which also needs applying the learned content) has miraculously applied the content/knowledge to be on top of the ranks, in playing this game simulation. In the future, a formal collection of feedback has been planned to be collated among students to understand its effectiveness on learning outcomes, skills, increase in students' knowledge and motivation.

In conclusion, the reformed learning activities adopt to reflect the professional practice based on the current market needs. Using experiential curriculum model to undertake a reformed curriculum, clearly shows its close relation to constructive alignment, a design for teaching, which is built on constructivism, where students are encouraged to construct their knowledge based upon participating in the learning activities to align with the intended learning outcome (ILO) (Biggs & Tang, 2011). Based on this constructive alignment and aligning with the course objective (our aim is to teach students how to run ERP in a business environment and not giving lectures on businesses running ERP).

In addition, experiential model ties well with constructive alignment which is based on constructivism too based on the experiences of the students participating in learning activities (Ruhi, 2016). This works consistently in which the course objective is to teach students on how to run ERP in a business environment. And each real-life simulated case scenario devised using experiential model would indeed reflect this purpose on teaching students on how to run ERP. This paper clearly shows how this experiential model will be applied through playing a simulation game of ERPSim on various processes/functionalities to be learned. The assessment tasks also include students participating and experimenting with this simulation game to solve real-life complex problems to enhance the learning experience and to apply current and relevant knowledge to an enterprise systems business scenario. In addition to this, the experiential curriculum aims to assist students to develop the "the learning to learn skills" to become efficient as self-directed learners.

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Virtual reality (VR) in Construction Education: A qualitative analysis

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Abstract

Over the past two decades, the extraordinary progress of innovative technologies such as virtual reality (VR) has contributed to unlocking new opportunities in the construction marketplace and holds the potential to continue exceeding the limitations set in the architecture, engineering and construction sectors. Students in the architectural, engineering and construction disciplines are taught to examine and interpret buildings and structures through the appraisal of 2D drawings and designs. Although strategies such as CAD are used to demonstrate designs in a 3D presentation, a scarce amount of advanced visualisation tools are used in tertiary education. The objective of this study was to understand how the implementation of virtual reality in construction education at the University of KwaZulu-Natal, could provide an ideal opportunity for students to experience, rather than imagine, the construction cycle. This qualitative study was conducted in two phases. Phase one was the demonstration of the virtual reality technology to sixteen construction studies honours students. In phase two, a focus group interview was conducted with eight students that attended the demonstration. The results obtained suggested that students see the advantages of using virtual reality technology in their respective modules but still favoured the traditional methods of learning over this enhanced technological learning method.

Keywords: Virtual Reality, Tertiary Institutions, Construction Education

Introduction

Virtual reality (VR) and augmented reality (AR) are popular trends that are being used in a variety of industries such as the gaming sector, education, entertainment, marketing, navigation, skills training and construction. Virtual reality is revolutionising the construction industry and is used from conception to completion of many construction projects. This technology is changing the way that construction is currently being carried out. VR is described as a believable and interactive 3D computer-created (virtual) environment that a user may be immersed into, with the environment being experienced and interacted with through visual, tactical, auditory and sensory stimuli (Lackey & Shumaker, 2015). This technology works in such a way that the simulation engages the five senses of the human body; taste, smell, hearing, touch, and sight in a manner in which the user begins to believe that they are present in the real life environment (Nguyen, 2014). The users of VR systems are able to physically walk around the computer generated objects and perceive these objects as if they were real.

It is important for students in the engineering and construction disciplines to be able to understand the construction processes through visualisation (Jaruhar, Messner & Nikolic, 2011). Students do not have the experience or the expertise to be able to make informed decisions and judgements about construction activities. Therefore, envisioning the theory being taught to them would play a key role in enriching their comprehensibility and help students draw a defined link between the theory being taught, real life construction processes, and finally its end products (Jaruhar, *et al.,* 2011).

Currently the University of KwaZulu-Natal (UKZN) does not have any VR equipment for construction students, nor have these students been exposed to VR on campus. This study was therefore undertaken to determine if VR should be introduced at UKZN in construction related qualifications for education purposes so that students can familiarise themselves with these technologies before they go into industry. Additionally, VR could also help students visualise the theory that is taught to them, allowing students to encounter realistic, construction related scenarios in a controlled environment. The introduction of this technology will also allow students to draw defined relationships between theory and the construction product and help them gain a better understanding of construction processes and procedures.

VR in the construction industry

Traditionally, endeavours pursued in the built environment have been delivered in the form of detailed, highly graphic documents known as technical drawings or drawing plans (Czmoch & PĊkala, 2014). Previously, these drawings had proven to be sufficient enough for professionals to design, construct and complete the projects for which they have been employed for. However, problems still occur during the project, due to lack of proper communication between the individuals involved, confusion on what was required, as well as a copious amount of time being spent during the design and conceptual stage (Czmoch & PĊkala, 2014). The flat, 2-dimensional imageries of a 3-dimensional world deliver information that does not fully do justice to the structure (Brown, Kahler & Watson, 2016). To combat this drawback, in the late 1990's to the early 2000's, architects started to convert the drawing plans into 3D digital models, using software such as Computer-Aided Design (CAD), SketchUP and Building Information Modelling (BIM) (Brown*, et al.*, 2016). From there professionals started using digital models to create virtual simulations known as digital construction. This is fast becoming a way to shape and enhance the efficiency of the construction industry.

The introduction of VR in the construction industry has allowed built environment professionals to successfully blend BIM and VR and create 3D models that are generated into something in which people can interact with. This allows one to have the opportunity to see a building in real time and up close, providing the chance to inspect and make changes to any part of the design as well as pick up any potential problems or setbacks before construction commences (Sharifi, 2018).

Through the use of VR, teams are able to collaborate with one another in real time, share views and opinions, ask questions, receive feedback and make decisions about the changes to be made (Sharifi, 2018). Therefore, VR is able to reduce rework on projects by making improvements on the accuracy and the level of detail of communication (Novotny, 2018).

While a few companies in the South Africa construction industry have embraced this new technological advantage, most engineering companies in the design and build sector are still debating whether or not it is worth the effort and cost to procure the equipment (Design Indaba, 2019). At present, architectural companies seem to be more willing and enthusiastic towards using VR equipment. It has proven to be a handy tool for architects as it is more efficient to make changes to the structure in the design phase than during the construction period. It also delivers an excellent platform to illustrate their ideas to clients (BuilderSpace, 2019).

However, these advanced technologies possess the ability to not only improve the construction industry, but also the education sector. Using computer simulations to permit students to encounter realistic, construction related scenarios in a controlled environment could prove to be one of the most effective lecturing techniques that is adopted in universities (Goedert, & Rokooei, 2015).

VR in construction education

Students in the architectural, engineering and construction (AEC) disciplines are taught to examine and interpret buildings and structures through the appraisal of 2D drawings and designs (Baratta, Messner, Whisker, & Yerrapathruni, 2003). Although strategies such as CAD are used to demonstrate designs in a 3D presentation, a scarce amount of advanced visualisation tools are used in tertiary education (Henriques, Martins & Sampaio, 2010).

Horman & Messner (2003: 2) indicated, "*observing and experimenting with the building construction process is very important but it is difficult to provide this opportunity to the students in an educational setting.*" Through the use of 3D and VR simulations, students are given the opportunity to investigate diverse 'what-if' scenarios and discern unique answers to disputes faced in the construction planning process (Horman & Messner, 2003).

With the adoption of VR in the construction education disciplines, students can have a feel of construction sites from the comfort of their lecture rooms (Keenaghan & Horváth, 2014). It also significantly increases the AEC students' comprehensibility and understanding capabilities as well as provides an opportunity to engage in an interactive learning process (Baratta, 2003).

Conventionally, lecturers use site visits as a teaching technique to illustrate to their students' the construction stages. While this has proven to be a resourceful and advantageous approach, it is also not always practical as site visits are too brief for students to gain exposure to every construction stage. Furthermore, it is also challenging to orchestrate these site visits and determine logistical procedures (Jaruhar, *et al.,* 2011). However, it has become possible to assist

all engineering and construction students in visualising the stages and procedures occurring on construction sites through the use of VR equipment (Hamza & Horne, 2006).

George (2018) concluded that virtual visits were a valuable addition to educational techniques and suggested that it offers an equivalent experience of physically being present on site. This approach also provides a solution to transportation and safety challenges as well as time constraints (Pereira & Gheisari, 2017).

Benefits of using VR in education

Sotiriou & Bogner (2008) and Martín-Gutiérrez *et al*. (2016) have drawn a definitive link between the use of virtual technologies and improvements in a student's educational performance, motivation and concentration. The challenge to participate, construct and influence objects in a virtual surrounding excites students and holds their attention. Virtual technologies have the potential to enhance a student's interpretive and problem solving skills as well as facilitate permanent learning (Yilmaz, 2018).

Virtual reality provides opportunities to students to experience, virtually see, touch, and hear the content being imparted to them (Rawal, 2018) rather than imagine circumstances and situations. The virtual world provides a more controlled environment than the actual world. Therefore, lecturers have the ability to manipulate what is presented to students so that the optimum amount of information can be transferred (Christou, 2010).

The use of VR can be exploited in instances where teaching via the actual environment, for example a construction site, is dangerous, impossible, inconvenient, cost inefficient or too time-consuming (Horne & Thompson, 2008). Furthermore, a student is provided with the chance to encounter subject matter that would otherwise be challenging to convey using conventional methods, thereby proving to be a valuable support mechanism to conventional learning paradigms (Bilyk, 2018).

Challenges experienced in the implementation of VR in education

While VR offers impressive opportunities for students in construction education, there are still several conflicts and obstacles that may be faced in employing the use of these versatile technologies. The way in which virtual technologies can be smoothly blended into the educational process is still being studied (Martín-Gutiérrez *et al*., 2016). The argument that every institution raises is that high resolution pictures are developed by large VR facilities with advanced visualisation and magnetic tracking aspects. Although this delivers a high quality visual display system, it is expensive to build these display structures (Baratta *et al.*, 2003).

At the moment there is not a large scope of software that can provide a display of 3D and 4D CAD models. Oftentimes it is necessary for students to convert or export these models from a specific

format to one that is more compatible. It is critically important that software becomes less complicated to use within virtual reality situations to eliminate this step (Baratta *et al.*, 2003).

One of the leading barriers that prevents tertiary institutions from incorporating VR as a learning tool is purely practical - it requires a lot of effort from both the inventors and lecturers' to produce quality VR material that will encompass the prerequisites of learning programmes. In most cases lecturers are unable to operate and conduct immersive experiences by themselves, resulting in experts being outsourced and consulted (Bilyk, 2018). Martín-Gutiérrez *et al*. (2016) had also identified this as a problem and stated that institutions and educators are more conserved to the idea of transitioning from traditional learning methods to interactive, immersive innovations that are out of their comfort zone.

Solomon, Ajayi, Raghavjee, & Ndayizigamiye (2018) found that lecturers were of the opinion that, taking into account the ever evolving nature of technological innovations, constant VR training must be a priority before and after its implementation so that the technologies are easier to use and understand.

Research Method

The research was conducted in two phases. Phase one involved the demonstration of VR to sixteen BSc Quantity Surveying (QS) honour students who were purposely sampled in the Construction Studies Discipline. The research selected these students because it was believed that these final year students would provide the most valuable information based on their experience and hindsight views in determining whether VR would have been beneficial to them throughout their tertiary education.

The VR technology was introduced by professional architects, who visited the UKZN Howard College campus and carried out the demonstration. The demonstrators introduced the concept of VR and explained to the students how it is used in the construction industry. Thereafter, the students were given the opportunity to use and experience the VR equipment as depicted in Figure 1.
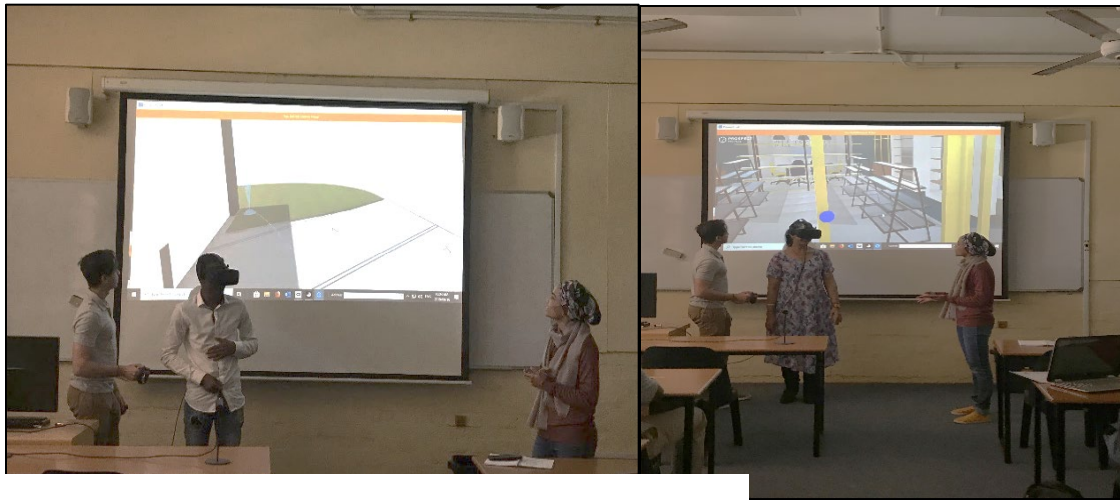
After the demonstration (phase 2), a focus group interview (Flick, 2017) consisting of eight (8) honours students was conducted so that a comprehensive understanding of student opinions could be obtained. Focus groups are characteristically made up of six to ten participants however, the group size can vary from a minimum number of participants of four to as many as twelve, which are dependent on the type of research that is being conducted (Flick, 2017) therefore the sample size of 8 was considered adequate.

The focus group lasted 90 minutes in which students were asked a set of questions and opinions (as discussed under the relevant themes below) were provided to the researcher. The responses captured by the researcher was based on the students' experience with the VR demonstration, which allowed the researcher to receive open and comprehensive perspectives on their view of VR in construction education.

Qualitative data analysis and interpretation were captured by the researchers using the *NVivo* software. This was completed by organising the data into categories for examination by the researchers. The information was analysed in order for the researchers to gain an overall understanding of the data collected. Thereafter, the information was coded into categories of similar words or phrases for which themes were then established.

Results of the Focus group

Figure 2 is a graphical representation of the most common words used throughout the focus group session generated by the NVivo software used for the analysis of the focus group data. Words such feel, experience, agree and help are some of the commonly used words.

Figure 2. Word map

Figure 3 illustrates the mind map used for the qualitative analysis, which indicates the themes that emerged.

Figure 3. Mind map of themes

Students' receptiveness to VR

The focus group discussion revealed that this was the first time that they [the students] had used VR. After the VR demonstration, students developed a deeper appreciation for the technology. Respondent 1 commented that it was "*enlightening to use. It was different and allowed us to see all the aspects which brought the product to life. It provided a visualisation of the 2D drawings which was different.*" Respondent 7 found that it was a fun experience. Four of the respondents felt that the experience of having your body in one place, and your mind in another, was confusing and overwhelming and took some time to adjust to it.

With regards to VR being implemented as a learning instrument, seven out of the eight students were keen on having it implemented as it would help in understanding procedures and concepts better. Respondent 6 said that "*if you want to visualise the interior of the building, VR is best.*"

It was found that the biggest motive for wanting VR implemented was because the students were of the opinion that they learn better with visualising work and drawings, which was a similar outcome found by Jaruhar, *et al*. (2011). Respondent 4 reflected that one can "*explain a concept but to actually see the process using VR might be better*". "*I think using these instruments can provide the link to theoretical work and practical application.*" Respondent 2 deliberated that "*at the rate at which technology is being implemented today, it's important to start getting used to it [VR] at an earlier stage.*"

In contrast to these views, Respondent 3 and 7 felt that while VR could help, it should not be implemented because "*in the hands of students, not everyone takes care of how they use equipment already in the institutions.*" This led to the researchers investigating the advantages and disadvantages of implementing VR.

The advantages and disadvantages of implementing virtual reality

After the demonstration was carried out, students had a better understanding of VR, specifically its uses in the construction industry. Respondent 2 felt that VR is "*a great way of turning 2D drawings into 3D models*" and Respondent 7 believed that it "*can help you visualise end products ….*" Overall it was believed that VR "*gives the client a view of what the product is*", as stated by Respondent 6.

Regarding the respondents' interaction with VR being clear and understandable, 5 out of the 8 participants found the technology to be easy to use with Respondent 7 saying "*… I found it easy to use, but I do not know how to set up the instrument*" and Respondent 8 stating that, "I *find that VR was not as simple. It would require more steps to understand it.*"

While many respondents felt that VR holds potential discomforts, 2 Respondents believed that, "*a longer period of time disorientation will be experienced and adjustments will have to be made to reality*" and "*long term use will be discomforting.*" Moreover, respondents felt that while using the VR instrument, discomforts were experienced such as dizziness, disorientation and nausea.

Relating to the opinions of the respondents with respect to VR helping them to perceive accurate dimensions and scales once they have used it, all 8 Respondents believed that VR models will be a better visualisation tool. However, the students believed that in order to obtain accurate dimensions, they would "*stick to 2D drawings*" and "*still refer to drawings to calculate the dimensions to get accurate values.*"

Concerning the respondents' opinion on how VR could improve their understanding of the work being taught, respondents believed it could definitely "*improve understanding and bring to life*

actual work so you see what is happening in real time". "*In modules such as design and construction technology, if these tools were implemented, I would better be able to comprehend all stages of construction.*"

The respondents were unanimous in agreeing that VR will make for a fun and memorable learning experience. Respondent 8 stated that "*.... students tend to remember stuff that they enjoyed and I find that these types of techniques will make work more memorable.*"

In terms of disadvantages, majority of the respondents believed that it would cause a distractive game like environment, with Respondent 3 indicating that the technology *"may cause students to drift away from the key concept that the lecturer is trying to teach and may focus on the technology more than actually learning something."* Respondent 3 further emphasized that "*many students today are interested in gaming technology, the graphics and presentations of virtual reality creates such gaming atmosphere for students."* and Respondent 8 stated that "*students may forget that they are still in a learning environment and may not remember to follow the rules or behave in the manner that is expected of them*".

Regarding the respondents' opinions on VR eliminating language barriers in the lecture room, the respondents believed that it could eliminate language barriers, but in a limited manner, by "*bringing clarity to the work that is being done"* (Respondent 1) and "*one sees construction graphically to correct any misunderstandings due to language barriers*" (Respondent 4).

With VR, Respondent 5 believed that "*comparing our university level and overseas standard, this instrument could help level the field"* and that by making use of VR, "*our level of education could increase.*"

When asked if the respondents believe that VR poses any disadvantages, Respondent 1 believed that in certain instances "*it can cause confusion for some students if they can't see the relation between the 2D drawings and the 3D model."* Furthermore, Respondents 7 and 8 thought that "*lecturers may not have access to VR models*" and that lecturer's may lack "*sufficient knowledge or experience to guide students in using this tool correctly."* Respondent 5 in particular believed that "*...expense wise, setting up more than one VR station, will be costly in terms of equipment and maintenance.*"

The incorporation of virtual reality in teaching methods

With respect to VR, Respondent 3 believed that it would be more useful to incorporate this learning instrument for architectural students rather than quantity surveying students as they can "*use the programme, design 3D models and then actually show it to get a mark for the module."* It was believed by Respondent 5 that VR should be implemented in the same manner in which practical's are currently implemented at university. This can be done by learning "*how to use equipment and go outside, incorporate it into the LAN sessions where we can have VR stations as well as throughout the course and modules where it can be introduced to specialise*

skills". The last suggestion in which VR could be implemented was through virtual site visits, which has the potential to replace actual site visits.

Feasibility

The final objective of this paper was to determine if it would be feasible for the Construction Studies Discipline to implement virtual reality as a visualisation tool and transition away from traditional methods. This theme also aimed to determine how it could prepare a student for leaving university and entering industry.

The students were asked if they would prefer to have an immersive experience about the construction processes instead of a theoretical lesson. The majority of the respondents believed that while an immersive experience removed limitations and provided obvious benefits, theoretical and traditional methods were regarded as more important aspects.
- *"If it is to be implemented, there must be a balance between immersive and theoretical studies"* - Respondent 4.
- *"I prefer to go to site. As much as it would be nice to use VR to view construction processes, I think we need to learn theory and then go to site and understand."* - Respondent 5.
- *"I prefer reading and learning from textbooks. I feel I gain a more thorough understanding and it's important we keep these methods"* - Respondent 8.

The students further believed that if one is not technologically inclined, VR could prove to be hard to use and *"it will require training and teaching people how to use it effectively and efficiently."* Two of the respondents felt that VR is difficult and complex.

When the students were asked their opinion on how they felt VR would prepare them for transitioning into the working environment, the following responses were received:
- *"You will leave varsity going into industry with better visual understanding of construction items and processes in construction."* - Respondent 2
- *"I have a big fear about this, but yes we should use it as a tool to develop our skills."* - Respondent 5.
- *"I am a very visual person and I have to actually see something to understand it.…VR will help me to see this which will prepare me for when I go to industry"* - Respondent 3.
- *"By using this equipment, I feel I would be better prepared for the transition from university to industry."* - Respondent 8.

It was established that most of the respondents interviewed were apprehensive to go into industry as they are aware that employment is completely different to university and VR would assist them in becoming better prepared.

Conclusion

The aim of the study was to determine the students' views on the usefulness of VR in their tertiary education based on their experience with the technology after a demonstration.   The study revealed that even though students did not use VR before, they did see its potential if implemented in construction education by providing the link for theoretical and practical application. However, the students were also apprehensive because they thought that VR could detract from the learning and create a game like environment. They also preferred to use 2-dimensional drawings to calculate dimensions. The students believed that the cost of procuring VR could be expensive and that the lecturers may not have sufficient knowledge or experience to guide students in using this tool correctly.

As an exploratory study, this study was limited to the honours students in the Construction Studies discipline and it is therefore recommended that this study be expanded to students in all years of study in construction studies as well as to civil engineering and architectural students.

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Emergency Online Learning (EOL) during the COVID-19 pandemic: Postgraduate students' perspectives

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Abstract

University students and staff experienced unprecedented, rapid change in 2020 when COVID-19 forced South African Higher Educational Institutions (HEIs) to rapidly implement online teaching and assessment. The typical undergraduate student difficulties of limited data and devices, poor connectivity and bandwidth issues, and varying digital competency levels, have been noted in previous research regarding the transition to Emergency Online Learning (EOL). However, relatively little is known about the experience of postgraduate students in South African universities as they transitioned to EOL. This study, therefore, set out to investigate how Commerce postgraduate coursework students in a College at a large University in South Africa, experienced a rapid shift from fully face-to-face teaching to fully EOL. This study was quantitative with data collected through an online questionnaire. The research revealed that these students find that there are no boundaries between their studies, home, and work-life. They experienced challenges with time management, and concerns about future employment and personal financial worries also impacted their academic studies. In terms of support, the elements of support from lecturers as well as the support from course administrators are really important in online learning. This research contributes to the specific focus area of online learning among coursework postgraduate students.

Keywords: COVID-19, Emergency Online Learning (EOL), Higher Education, Online Teaching And Learning, Postgraduate Coursework Students, South Africa

Introduction

Higher Educational Institutions (HEIs) across the world were faced with unprecedented, rapid change in 2020 (Anon, 2020a; Burgess & Sievertsen, 2020) as a result of the COVID-19 pandemic which forced the sudden closure of campuses. Most universities implemented online teaching and learning in an attempt to save the academic year (Wolff, 2020; Mohamedbhai, 2020). University staff and students had to rapidly embrace change, and adapt to the demands of the new online environment (Cleophas, 2020; Griffiths, 2020; Wolff, 2020; Ngqakamba, 2020).

The pandemic resulted in a strict lockdown in South Africa, with students and staff being sent away from campus in March 2020. Staff had to adjust to remote teaching and had to rapidly

attend online training on how to teach online (Wolff, 2020). No teaching and learning initially occurred during the national shutdown, and then eventually there was a shift to Emergency Online Learning (EOL) (van Rooi, 2020; Ngqakamba, 2020), which officially commenced in May 2020.

EOL is not a planned form of teaching and learning. It arose in a situation where sudden, unplanned change brought about by a major disruption in the environment (van Rooi, 2020), required "emergency responses" for the organisation to "adapt or face extinction" (Anon, 2020a). Diverse, multiple challenges were experienced as South African universities made the transition to EOL (Cleophas, 2020). Many students experienced difficulties, which hampered efforts to successfully transition to online teaching and learning. Previous studies revealed challenges related to limited data and devices, poor connectivity and bandwidth issues, and students living in rural areas battling to find conducive study spaces (Amrane-Cooper, 2020; Cleophas, 2020; Wolff, 2020; Mohamedbhai, 2020; Allo, 2020).

Many studies have looked at the impact EOL had on undergraduate students or the university student body as a whole, however, few studies have looked at postgraduate students' perceptions of the transition. Postgraduate students are typically working, older, more mature students, and may be classified as "adult learners". They have different learning and support requirements to undergraduate students and tend to be more intrinsically motivated (Canning, 2020; Krieger, 2020). Postgraduate classes are smaller, learning is often group and project-based, and teaching is typically discussion-based with high levels of engagement (Baharudin, Murad & Hj Mat, 2013; Krieger, 2020). Carter (2013: 565) argued that "more research is needed on how staff and students manage virtual place and space learning in online postgraduate programmes".

The transition to EOL provides an ideal opportunity to take up Carter's largely unanswered call. The authors of this paper conducted an initial exploratory study (Singh et al., 2020) to investigate the attitudes of postgraduate students in a Business School to EOL. This initial study led the authors to consider broadening the scope to focus on all Commerce coursework postgraduate students to examine their experience of transitioning to EOL.

The specific research objectives were:
- To determine how social support and economic issues impact postgraduate students transitioning to EOL.
- To identify how digital competence impacts postgraduate students transitioning to EOL.
- To determine the perceptions of the levels of support and training received by postgraduate transitioning to EOL.

In this study we posit:
- Hypothesis 1: Postgraduate students' perceptions of online experience, social support, economic worry, and technological competence will be positively related to ease of transitioning to online learning.

- Hypothesis 2: Postgraduate students' perceptions of online experience, social support, economic worry, and technological competence will be positively related to their success in transitioning to online learning.

This study is significant as South Africa has prioritized postgraduate education, and aims to see an increase of students in postgraduate studies (Naidu & Nkabinde, 2019). Additionally, postgraduate students may now have more options available to them, as more courses move online (Griffiths, 2020; Canning, 2020). Dr Blade Nzimande, the Minister of Higher Education, Science and Innovation said that "blended and multimodal learning, including digital and online learning must become a standard part for the future higher education system" (Businesstech, 2020). Thus it is critical that HEIs determine how best to create a positive online learning space in order to retain the more financially lucrative postgraduate student cohort (Canning, 2020).

Literature Review

While online learning has only been available as a mode of teaching since the development of the world wide web, it has roots back in distance education - "a method of teaching where the student and teacher are physically separated" (Kentnor, 2015, p.22). Over 15 years ago researchers were predicting that online learning would be "a complete substitute for both distance learning and the traditional face-to-face class" (Hiltz & Turoff, 2005, p.60). However, while many universities included elements of blended learning - a blend of face-to-face and online delivery (Allen & Seaman, 2006), few shifted to supporting complete online teaching and learning. World Bank (2020, p.2) furthermore highlight that, in response to the global crisis, "few, if any, countries, regardless or region or income level, had rapid response plans in place to coordinate such a massive effort as closing entire education systems".

After Stanford University released their first MOOC (Massive Open Online Course) there was an upsurge in interest in online learning (Pappano, 2012). However, as Crawford et al. (2020) point out, a shift to online learning does not happen overnight. There are several key issues that have been consistently identified as problematic with online learning. These include policy issues, inappropriate pedagogies and curriculums, work-life balance challenges, technical competence of staff and students, motivation and self-discipline, technology complexities, data connectivity, and economic challenges (Adedoyin & Soykan, 2020; Aljaber, 2018; Berge, 1998; Blewett, 2016; Dhawan, 2020; Gillett-Swan, 2017; Yan, 2020).

Yet, despite these issues, the COVID-19 crisis brought about a situation where a switch to online learning was no longer an option but a necessity (Dhawan, 2020). However, just because online learning was now a necessity did not mean the issues were no longer relevant. In fact, institutions' lack of preparedness for the crisis further highlighted the issues that had already been identified as critical to the effective deployment of online learning (Zhong, 2020; Toquero, 2020).

As most institutions were not using online learning in any significant way prior to the crisis, the result was a switch to what is more accurately described as Emergency Online Learning

(Boardman et al., 2020). While online learning was a well-established area of research, at the time of writing Google Scholar only returned 47 results for the search term "*emergency online learning*".

EOL is by its very definition deployment without warning which has the potential to further exacerbate the issues (World Bank, 2020) that traditionally affect online learning. However, EOL also provides a useful lens through which online learning can be viewed, as a rapid transition and need to focus on efficient and effective approaches is required.

Current studies on EOL focus on undergraduate students' experiences or on the overall university experience. Research conducted by Jayasekara (2020), while not mentioning "emergency online learning" looks at postgraduate students, however, the focus of this study is on "learning styles" and not student perceptions of the transition to EOL.

We believe that the postgraduate students' perspectives provide an opportunity to gain helpful insights into what is required for an effective transition to EOL. As such we conducted an initial exploratory study (Singh et al., 2020) to investigate the attitudes of postgraduate students in a Business School to EOL. Arising from this study we suggested a model of EOL, as presented in Figure 1. The model shows the necessary factors for the success and ease of transitioning to EOL. These include Social Factors (SOC) such as Social Interaction (SOC_INT), Study Space (SOC_SPA), Support (SOC_SUP), Family and Work Pressure (SOC_PRE); Perceptions of Online Experience (EXP); Technological Competence (TECH); and Economic Worry (TECH). We posit that SOC, EXP, TECH, and ECO significantly influence Ease of Transitioning, while EXP also influences Success of Transitioning.
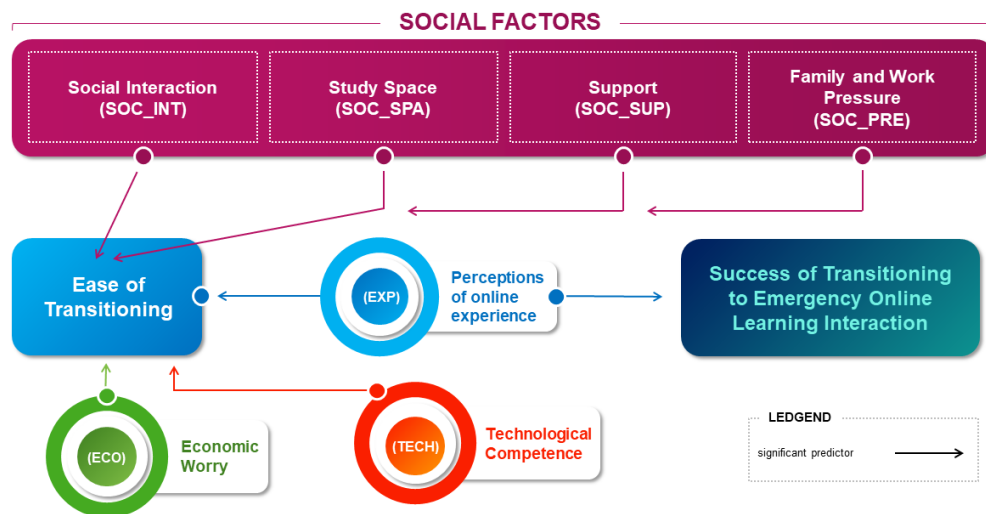

Figure 1: Model of EOL (Source: Singh et al., 2020)

Research Methodology

A quantitative, non-experimental research method was deemed most suitable to answer the research questions regarding the attitudes and perceptions of postgraduate students transitioning to EOL (Creswell & Creswell, 2017). The population were all commerce faculty postgraduate coursework students registered within one college at a University in South Africa. The sampling strategy utilised nonprobability with a purposive expert design.

A notice with a link to the online survey was posted on Moodle, the prescribed Learning Management System (LMS) at the Institution, with a link to the research questionnaire. Data was gathered from 25 September - 6 October 2020, during semester two and COVID-19 level one.

The survey questionnaire was designed based on the literature related to online learning and emergency online learning. The instrument consisted of six parts; Demographics, Perceptions of the online experience, Social; Economic, Technological; and Student experience. Data for the quantitative aspect of the study was analysed using the Statistical Package for the Social Sciences (SPSS) v.26 for descriptive and inferential statistics.

Results and Discussion

Forty-one respondents completed the questionnaire. Once the data was cleaned, the final sample was 24 (N = 24). As indicated in Table 1 below, the study participants were majority black (62.5%) female (75%), between the ages 18 to 25 (79.17%) who are single (95.83%). The majority of the participants were unemployed (62.5%) and paying for their own studies, either self-funded (37.5%) or family funded (37.5%), who were completing their coursework (79.17%) at the time of data collection.

Table 1: Demographics

Variable	Categories	N (%)
Gender	*Female*	18 (75)
	Male	6 (25)
Age	*18-25*	19 (79.17)
	26-35	2 (8.33)
	36-45	3 (12.5)
Race group	*Black*	15 (62.5)
	Indian	7 (29.17)
	Coloured	1 (4.17)
	White	1 (4.17)
Marital status	*Single*	23 (95.83)
	Married/ In a partnership	1 (4.17)
Funding for studies	*Self*	9 (37.5)
	Organisation	1 (4.17)
	Bursary, Grant	5 (20.83)
	Family member	9 (37.5)
Employment status	*Full-time*	6 (25)
	Part-time	1 (4.17)
	Unemployed	15 (62.5)
	University tutor or intern	2 (8.33)
Study course	*Bachelor of Commerce Honours (Business Finance)*	1 (4.17)
	Bachelor of Commerce Honours (Economics)	4 (16.67)

	Bachelor of Commerce Honours in Industrial Relations	1 (4.17)
	Master of Accountancy	1 (4.17)
	Master of Commerce in Economics	1 (4.17)
	Master of Commerce in Finance	1 (4.17)
	Master of Commerce in Marketing	1 (4.17)
	Master of Laws (Business Law)	2 (8.33)
	Master of Laws (Constitutional Theory, Law and Litigation)	1 (4.17)
	Master of Laws (Labour Studies)	1 (4.17)
	Master of Laws (Medical Law)	2 (8.33)
	Master of Laws in Child Care and Protection	3 (12.5)
	Master of Philosophy in Child Care and Protection	2 (8.33)
	Masters in taxation	1 (4.17)
	Master of Laws	1 (4.17)
	Postgraduate Diploma in Industrial Relations	1 (4.17)
School	*School of Law*	13 (54.17)
	School of Management, Information and Governance	3 (12.5)
	School of Accounting, Economics and Finance	8 (33.33)
Campus	*Howard College*	13 (54.17)
	Westville	11 (45.83)
Stage	*Completing coursework*	19 (79.17)
	Working on dissertation	5 (20.83)

The dependent variable in this study 'transitioning to online learning' was measured with 'ease of transitioning' and 'success of transition' using a one-sample t-test. No significant results were noted.

As per Figure 2, indications are that respondents did not find the transition as smooth as anticipated, (Slightly easy, 42%) and (Slightly difficult, 30.4%).
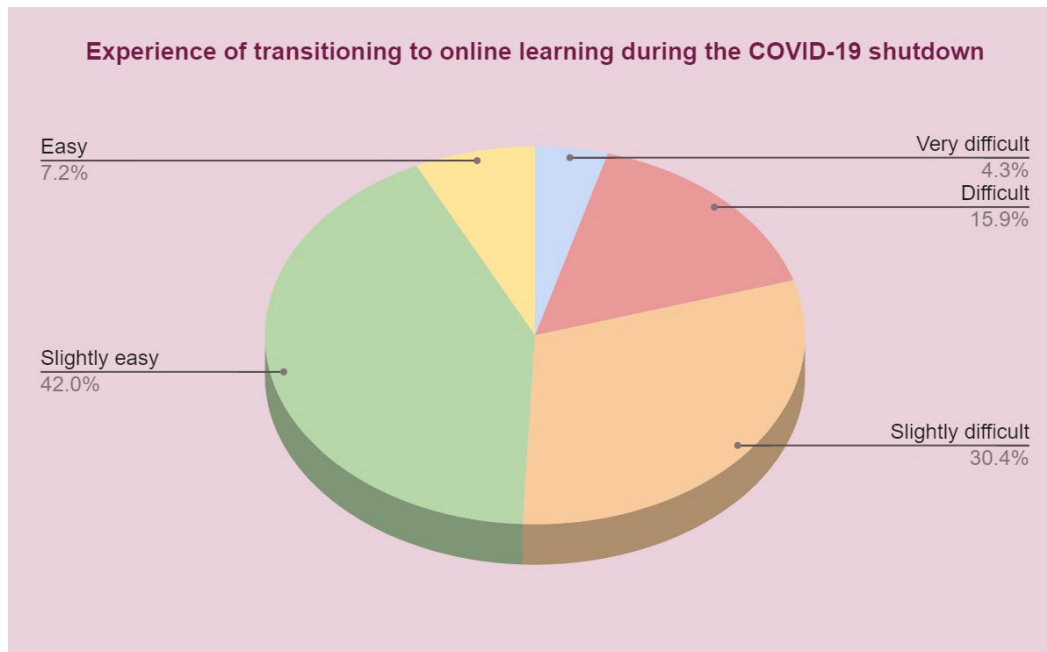

Figure 2: Transitioning Experience

While many respondents were neutral about the success of the transition to online learning, as highlighted in Figure 3, 16.67% strongly agreed that the transition was successful.
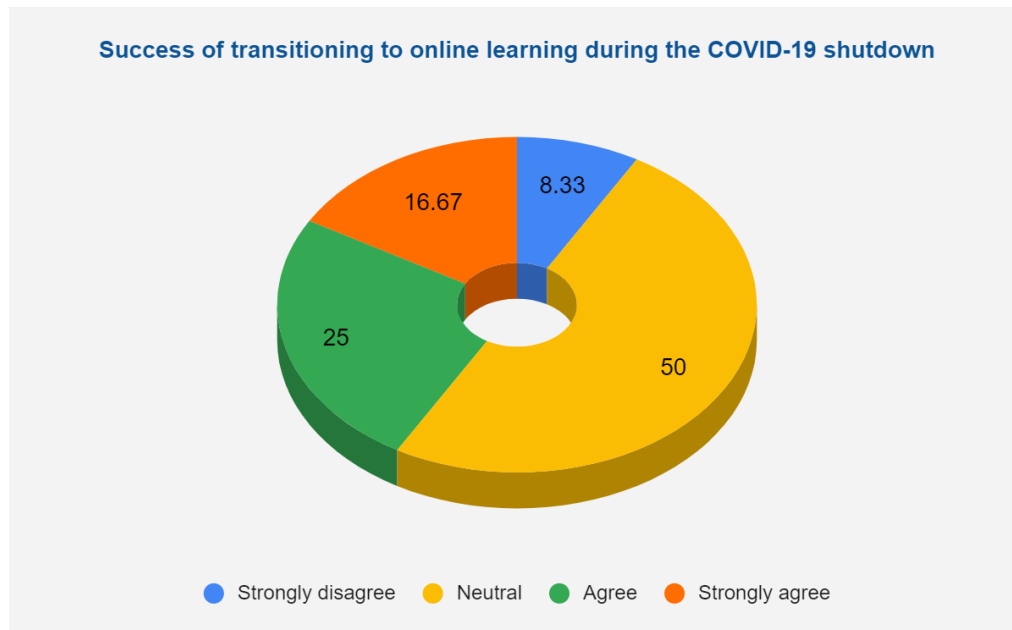
Success of transitioning to online learning during the COVID-19 shutdown

- 8.33
- 16.67
- 25
- 50

● Strongly disagree ● Neutral ● Agree ● Strongly agree

Figure 3: Transitioning success

Perceptions of the students' online experience were measured using 10 Likert scale questions as presented in Figure 4. While the results of the one-sample t-test revealed that there was no significant agreement or disagreement to any of these items, 20.83% of the respondents indicated that online learning facilitates learning more than face-to-face learning; and they are able to learn better online. A small percentage, 33.33%, suggested that they are able to learn concepts better in the online environment; and that online learning is suitable for their choice of study programme. 29.83% considered online learning to be more encouraging and affirmed that online learning makes it easier for them to complete their study tasks.
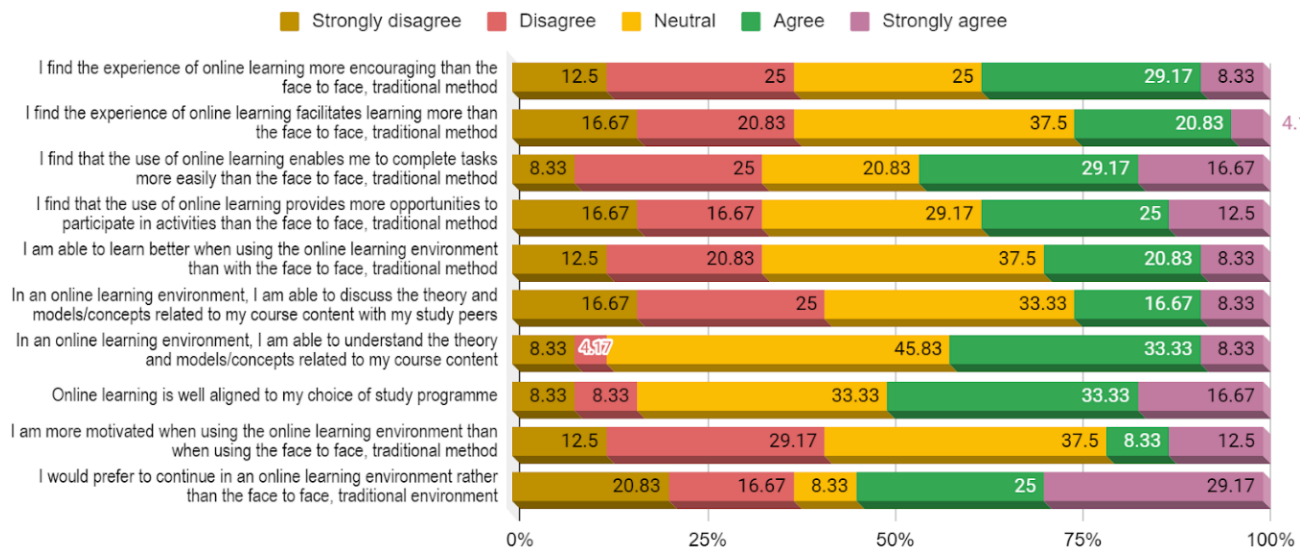

Figure 4: Perceptions of online experience

These items were subsequently analysed using factor analysis with Promax rotation to identify any underlying groupings of the items regarding preferences. Item 9 was dropped in the analysis because it did not make sense with the grouping. When dropped, the remaining items loaded onto a single factor. A KMO value of .804 (Table 2) indicates that the data was adequate for successful and reliable extraction of factors. In addition, a significant Bartlett's test shows that correlations between items are not too low, thus confirming reliable factor extraction has taken place.

The single factor accounts for 66.2% of the variance in the data. These nine items can be combined by averaging individual scores across the items to produce a reliable (Cronbach's alpha = .934, measurement for 'the experience of online learning' (EXP), as indicated in Table 2. A higher score indicates a better experience.

Table 2: Cronbach's alpha summary

Construct	Items included	KMO	Variance extracted	Cronbach's alpha (reliability)
Online experience	1 – 8, 10	.804	66.2%	.934

A one-sample t-test was applied to EXP to test for significant agreement or disagreement that the experience was favourable. Results show that there is neither significant agreement nor significant disagreement (M=3.01) that the experience was favourable, p=.962.

Table 3: Significant results of t-test analysis of Social and Economic constructs

Construct	Sub-construct	Mean (SD)	p-value
Social	The support I have received from the Course Administrators during online learning is sufficient	3.5 (1.142)	.043*
	The support I have received from the Lecturers during online learning is sufficient	3.67 (1.167)	.010*
	I have more work pressure currently than pre-COVID-19	3.79 (1.615)	.025*
	I have more family pressure currently than pre-COVID-19	3.71 (1.334)	.016*
Economic	Since COVID-19, I am worried about job security	4.00 (1.328)	.005*
	Since COVID-19, I have less access to personal financial resources	3.50 (1.022)	.025*

*Indicates significance at the 95% level

The results indicated that a significant number of respondents agreed that the social support (SOC_SUP) they received from the course administrators (mean=3.5, p=0.43) and lecturers (mean=3.67, p=.010) during online learning was sufficient. Further, there was significant agreement that the increased work (mean=3.79, p=.025) and family pressure (mean=3.71, p=0.16) (SOC_PRE); as well as increased economic worry (ECO) indicated by concerns over job security (mean=4, p=.005) and less access to personal financial resources (mean=3.5, p=.025) significantly impacted their ease of transitioning to the online environment. Carter (2013, p.566) in her research, found that student satisfaction was aligned with "good quality instructors, who were highly experienced and well qualified practitioners, capable of designing interactive, collaborative, reflective and critical online environments". This is also highlighted in the World Bank (2020) report, emphasising the need for teaching staff to be taught how to teach remotely.

Technology

Ninety-two percent (92%) of respondents are somewhat confident using technology in general (*p* <.0005). 33% of the respondents share devices with family members. A significant 96% of respondents have access to the internet (*p*<.0005). Regarding the use of applications and preferred means of communication, the results from a chi-square goodness-of-fit test show that: Zoom/Skype and email are used by a significant 9 (37.5%) and 11 (45.8%) respondents respectively to communicate with lecturers, p=.001; and a significant 21 (87.5%) respondents prefer using a laptop/desktop computer to facilitate online learning (p<.0005). This is similar to Jayasekara's (2020) findings that observed that the use of Zoom was effective to support learning.

Student experience

Eighty-three percent (83%) of students indicated that COVID-19 has affected their studies, p=.002.

Hypothesis testing

To test the effect of the EOL experience, regression analysis (Table 4) was applied with the Dependent Variable (DV), *ease of transitioning* and *success of transitioning* with the Independent Variable (IV), *perceptions of online experience (EXP), social support (SOC_SUP), social space to work (SOC_SPA), social interaction with peers (SOC_INT), social pressure (SOC_PRE), economic worry (ECO)*, and *technological competence (TECH)*. When applying stepwise regression with the five independent variables, only SOC_SUPINT is in the final model and accounts for 46.4% of the variance in the dependent variable 'Ease of transitioning', F (1, 22) = 19.071, p<.0005. SOC_PRE (β = .681, p<.0005) is a significant predictor of 'ease of transitioning'. The more support and interaction the student experiences, the easier they found it to transition.

Table 4: Stepwise regression analyses

Dependent variable	Independent variable	Coefficient		Model			
		Beta	p-value	R^2	F	df	p-value
Ease of transitioning	Perceptions of the online experience (EXP)	excl		.464	19.071	1, 22	<.0005*
	Interaction SOC_INT	.681	<.0005*				
	Pressure SOC_PRE	excl					
	Economic ECO	excl					
	Technology TECH	excl					

Successful transitioning	EXP Perceptions of the online experience	excl		.46 6	19.22 0	1, 22	<.0005 *
	Inter SOC_INT	.68 3	<.0005 *				
	SOC_PRE	excl					
	Economic ECO	excl					
	Technology TECH	excl					

* Indicates significance at the 95% level

excl – excluded from the model

A comparative analysis between the Business School (Singh et al., 2020) and Commerce data sets is offered below.

Towards a model for EOL Transitioning

Perceptions of the overall experience is significantly better for the Commerce postgraduate student group (M=3.01) than for the Business School group (M=2.41), p=.004. There was no significant difference across the Business School group and Commerce postgraduate student group. For economic factors, regarding the overall ECO measurement, economic pressures are significantly greater for the Commerce postgraduate student group (M=3.56) than for the Business School group (M=2.91), p=.006. Adult learners can experience financial-related challenges as they often pay for their own studies (Baharudin et al., 2013). There is no significant difference in Technology between the groups, yet the results show that significantly more Commerce postgraduate students do not have access to data (p=.012).

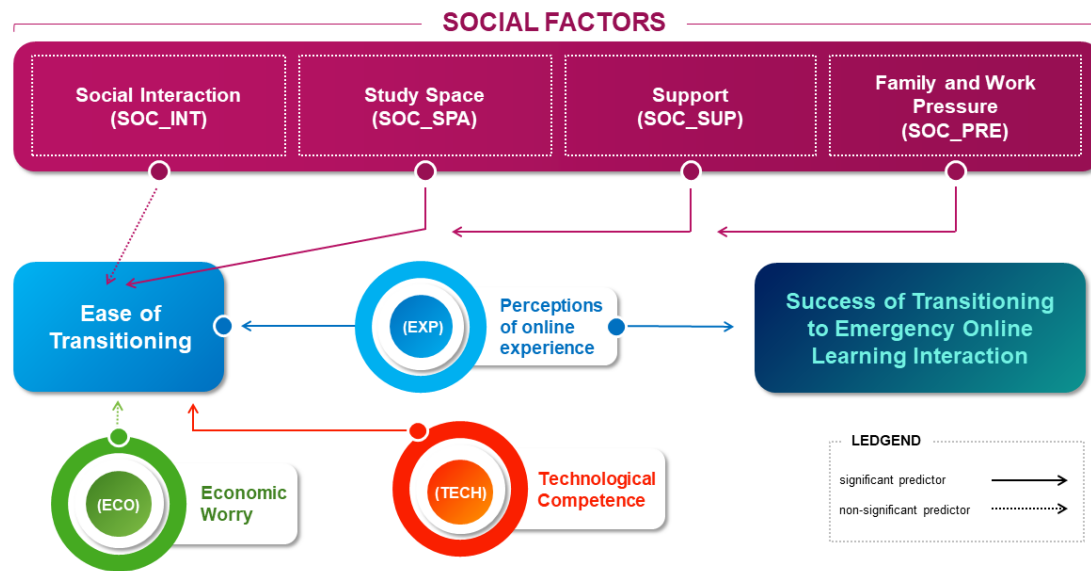The model of the Business School students' results is shown in Figure 5.

Figure 5: Model of EOL for the Business School students group (Source: developed by the researchers)

In this model (Figure 5), it can be seen that Study Space (SOC_SPA), Support (SOC_SUP), Family Pressure (SOC_PRE), and Technological Competence (TECH) are significant predictors of the ease of transitioning to EOL. Additionally, Perceptions of the Online Experience (EXP) are significantly related to the Ease of Transitioning. However, while economic issues are ever-present for students in South Africa, they are not a significant predictor of the ease of transitioning to EOL for this group of students.

The model of the Commerce coursework Postgraduate students' results is shown in Figure 6.
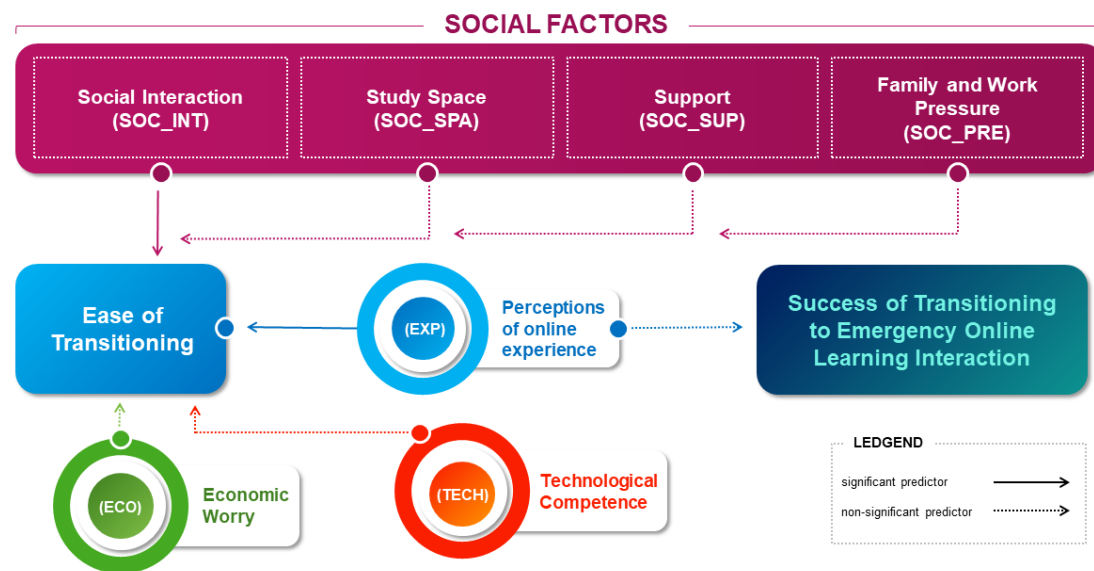
Figure 6: Model of EOL for the Commerce students group (Source: developed by the researchers)

In the Commerce students group, 83% reported that COVID-19 has affected their studies. The success and ease of transitioning to online learning was significantly predicted by the interactions between student peers (SOC_INT in Figure 6). It was also found that students had adequate support from family, friends and classmates to undertake online learning and were motivated and focused to do online learning. The data further highlighted that students find that there are no boundaries between studies, home, and work life. In addition, time management was a challenge now that they were doing online learning. Adult learners experience challenges with time management, having to balance work, family and their studies (Baharudin et al., 2013).

Regarding economic pressures, respondents reported being worried about future employment, with personal financial worries impacting on their academic studies. In terms of support, the elements of support from lecturers and programme administrators are really important in online learning. The respondents had significant external pressure and economic pressure. The results on technology showed that 83% are somewhat confident using Moodle, 79% are very confident in using WhatsApp, 75% are very confident with Microsoft Word, and not so confident in using Turnitin (63%) and using UKZN online library (75%). The results revealed that students had to share devices with family members (33%).

As depicted in Figure 6, financial concerns came through strongly for the Commerce group of respondents in this research.

We wonder how many of the postgraduate students in this context could be considered part of the "missing middle" – these are students who are from the middle class and who are not considered "poor enough" to receive NSFAS funding (Naidu, 2020a; Anon, 2020b).

Conclusion and Recommendations

This research was focused only on the views of postgraduate students and thus did not include opinions of other stakeholders, e.g. academics, support staff, the leadership of the institution, or even the Department of Higher Education. The small sample sizes are a limitation, hence the Cohen's d effect size calculations were performed and reported in the results section. The data was gathered from self-reported data from postgraduate students in one college at a public university in South Africa; caution should therefore be noted to generalise these findings. Nevertheless, the research makes an important contribution to understanding the experiences of postgraduate learners in the context of EOL.

As this is a growing area of research, future studies should test and replicate the model with postgraduate students in the context of emergency transitions to online learning. As universities in South Africa continue with the COVID-19 recovery plan and proceed with online learning in 2021, there will be merit in adding measures of faculty and administrator perceptions as research variables to expand the model.

Future research could investigate the coping strategies of staff and students as they entered the "new norm" of HEIs. It will also be interesting to examine how students across the HEIs in South Africa feel regarding the future (Blackmon & Major, 2020). Now that online teaching and learning is here to stay, how do the key stakeholders, including academics, support staff, and parents, actually feel (Mohamedbhai, 2020; Carter, 2013)? We also need to remember that EOL occurs within the context of remote working and decreased support (Wolff, 2020). Carter (2013: 565) reminds us that "the support needed at an institutional and school discipline level, versus the support provided to design, lead, manage and teach online postgraduate courses, requires attention".

The experiences of students are also important. If we assume that students were fully enabled to do online teaching and learning at their homes, what would they be sacrificing or not gaining from having lost the face-to-face contact teaching and learning experience (Schleicher, 2020)? We know that networking and peer support is critical (Krieger, 2020), so how would policymakers or leadership deal with this in the new norm? Finally, there is room to explore the perspectives of postgraduate students who are doing 100% research degrees.

Students are regarded as a key stakeholder or even as a "customer" in some instances in HEIs. As such, understanding their perspective of the transition to EOL is imperative, especially as it seems likely that online learning may become more widespread going forward (Businesstech, 2020). This study has provided insights for HEIs to enable technology-enabled learning environments that promote effective teaching and learning in the domain of postgraduate education for coursework students.

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The potential of MOOCS towards student access to higher education in developing countries

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Abstract

Technologies bring many advantages in our daily lives, the education sector inclusive. Many Institutions of higher learning in developed countries have embraced these technologies, but little is done in developing countries. The advent of Massive Open Online Courses (MOOCs) have the potential to improve the state of higher education in developing countries. MOOCS could improve the institutions of higher education's access, no funding and flexibility of students. This study investigated how MOOCs could improve higher learning institutions in developing countries by reaching the masses that fail to get access to tertiary education. The study developed a model to help in the implementation process.

Keywords: MOOCs, MOOCS Implementation, Higher Education institutions, Education Accessibility, developing countries.

Introduction

Technologies play a vital role in the day-to-day operations of educational institutions. Such operations like teaching and learning, administration, research, and it is vital for building the knowledge economy. The introduction of electronic learning (e-learning) at tertiary levels has created a virtual environment that enables learners to actively discover knowledge on their own, at their suitable times and interact with peers across the world. E-learning has taken a new route with the introduction of the Massive Open Online Courses (MOOCs) to reach those learner in disadvantaged areas (Liyanagunawardena et al., 2013).

Several researchers have identified developing countries barriers to online learning such as low bandwidth, poor technological infrastructure, poor electricity supply and weak internet connectivity (Abidi et al., 2016 ; Faridha, 2005). Other challenges that face developing countries' usage of online resources are, online content design including language barriers, evaluation, and accreditation (Chen et al., 2017 ; Xing & Marwala, 2017). Amidst these challenges, researchers (Oyo & Kalema, 2014) provide the strategy for implementation of MOOCs in Africa clustered under five baseline requirements. These requirements are; national accredited MOOCs curriculum, electronic content development, development of a central eLearning platform, establishment and funding of MOOCs coordination units at public HEIs, and establishment of MOOCs access hubs at strategic locations.

Challenges of institutions of higher learning in developing countries

Challenges in the use of ICTs in the developing countries are still many, which include but not limited to lack of ICT skills, inadequate bandwidth, high cost and lack of support (Kang et al., 2018). MOOCs barriers also include lack of equipment and their reliability, lack of technical support, and other resource-related issues. Other challenges include lack of financial resources, corruption, and political instability among others(Hori et al., 2016 ; Ma & Lee, 2018) .All these challenges, significantly impedes the quality of service, calling for the need to design appropriate learning material and models needed for implementation of MOOCs in developing countries. Developing countries need more suitable engagement tools such as lower resolution videos, offline tools, and offline reading and composition of replies (Liyanagunawardena et al., 2013). Researcher (Muganda et al., 2014) calls for research to examine and develop how MOOCs model that supports platforms and programmes for delivery under low bandwidth modes can be developed.

Characteristics of MOOCs

MOOCs is an abbreviation for Massive Open Online Courses which is a model of education delivery that has no limit on enrolment, open to everyone usually with no tuition and a course with a curriculum that leads to an award after the completion. The introduction of MOOCs can be seen as the extension of different approaches used in teaching and learning in terms of open online access and scalability. MOOCs have become commonplace in the e-learning landscape and have attracted learners with a variety of backgrounds. It is a recent innovation that can provide learning opportunities to large numbers of people across the globe and has been hailed as a solution to the developing world's lack of access to education (Emanuel, 2013 ; Liyanagunawardena et al., 2017).

According to (Gregori et al., 2018), the major aim of MOOCs is to open up education so as to provide free access to courses at a university level to as many students as possible. He alludes that there are two key features of MOOCS compared to the university online courses. These features are open access where anyone can access the online courses free and scalability where courses are developed to support a very large number of students. The introduction of MOOCs supports the ideal that knowledge could be shared freely and the desire to learn could be met without demographic, economical and geographical constraints (Rodriguez, 2013).

Apart from providing an enhanced tool for education delivery, online learning also promotes flexibility, accessibility to open educational resources, and good communication among learners and facilitators (Stracke et al., 2017). Most notably, these new learning technologies are bringing about massive change in university education worldwide.

Factors influencing MOOCs implementation in higher education

The implementation of MOOCs in higher education lies in their capacity to overcome the social exclusion of vulnerable groups based mainly on gender, age, socio-economic status and ethnic

origin. Many factors influence the Implementation of the MOOCs, these factors may vary from one organization to another (Gregori et al., 2018). A study conducted by (Jouicha et al., 2020) have indicated that factors such as Individual, organizational and environmental are key to the implementation of any IT related system.

Researchers (Legros et al., 2009) which encouraged participants to provide honest narratives of their experiences of failure highlighted power outages, intermittent Internet connectivity, and inadequate bandwidth as most common failures in Africa, reported that many countries in Africa where almost all are developing are still experiencing all these challenges. Mostly the developing countries bandwidth limitations have been serious constraints. Due to the fact that most of the learners and teachers come from very poor backgrounds, the majority of them have limited to no capability of using these digital equipment (Castillo et al., 2015).

Benefits of MOOCs in higher learning education

The introduction of MOOCs can potentially benefit both the learners and the providers of online courses. For learners, these platforms provide low-cost online courses and make higher education accessible to Internet users. MOOCs eliminate the need for students to travel to classrooms, enabling students to learn at their convenient location saving them the transportation cost. Study times become more flexible as students can learn at a comfortable pace. MOOCs also enable lifelong learning as they attract users ranging from teenagers to retirees (Ang et al., 2018). According to (Jouicha et al., 2020), MOOCs could act much like social media, where student discussions expand social experiences for students who participate.

MOOCs are also part of the marketing strategy of the institutions, experimenting with courses, and increasing visibility of instructors. A number of MOOC platforms offer courses independently or in collaboration with universities. The decision makers at the institutions may also experiment with these platforms, which are inexpensive and have a low risk to address budget constraint problems and lower the cost of degree courses (White et al., 2015).

The MOOCs can also be beneficial to the instructors to improve their skills and career development, building their reputation, recruiting students to their programmes (Clark et al., 2017). MOOCs also gives them an opportunity to network with other specialists in the same environment. Instructors can experiment with technology to reach different students with the different learning styles. Feedback can be easily attainable and the use of short videos that can keep students engaged and will develop interest for students (Yang et al., 2017).

Several other studies (Liyanagunawardena et al., 2017 ; Walker & Loch, 2014 ; Yang et al., 2017) pointed the advantages that MOOCs provide and these are; provision of high quality, low cost and high scale education; MOOCs also increase access to higher-education learning. More still MOOCs promote autonomous, independent and flexible learning. It also allows learners to focus on learning rather than on getting a qualification; and promote the provider institution, professor or study programme.

Developing countries perspective of technology usage in education

Studies such as (Frehywot et al., 2013 ; Graham & Misanchuk, 2004) have talked about the limited access to online resources and low quality videos because of low bandwidth. Some of the challenges of online learning in developing are affordability and limitations to technologies (Gedera, 2014) and some software functionalities are limited in the low bandwidth areas (Salmon & Yang, 2014). Personal factors such as attitude, cultural and social interaction differences and anxiety are associated with the negativity in using technologies (Haddon, 2016 ; Stoessel et al., 2015 ; Zaborova & Markova, 2016).

Most of the tertiary institutions in developing countries still struggle with the non-availability due to the high cost of bandwidth. There is also the inequality of access to technologies, which causes the digital divide amongst the students themselves; some of them are unable to afford computers due to the relative cost to the average income of workers in the country (Hinostroza, 2018). Irregular power cuts are still challenges in most of the developing countries and affects almost every aspect of the economy, which include the education fraternity. The cost of Internet connectivity is still high hence; it is still a challenge for students to afford. (Omotayo & Tiamiyu, 2017) suggested that the Nigerian government should make Internet connectivity a priority for higher education to be able to leverage on the promises and opportunities ICTs present.

The deployment of e-learning is dependent on the speed of bandwidth. Bandwidth refers to the amount of information that can be sent or received at a point on a computer network, the greater the bandwidth, the greater the carrying capacity and speed of transmission. The higher the quality and quantity of audio, video, interaction and processing tasks, the more sophisticated the communications technology required (Traxler, 2018). Bandwidth costs money, so it is imperative to manage the amount of bandwidth used for e learning, particularly where it is used to support remote and distance users who may not have access to fast data connections. Furthermore, the content and services that can be accessed through the internet are dictated by the bandwidth available (Hillier, 2018). Researchers Damary et al. (2017) asserted that one of the biggest challenges is limited bandwidth and adaptation to the online collaborative learning tools.

MOOCs have emerged as a popular mode of learning since its invention in 2008 (Lewin, 2013). However, MOOCs has been widely benefiting areas with good technological infrastructure such as, stable and reliable networks, electricity, ICT backbone and good bandwidth. Little has been done to implement MOOCs in areas which lack these infrastructures calling for its offline access (Ang et al., 2018 ; Barteit et al., 2018).

Related Work

This study is motivated by the fact that there is a need for the development of a model that could address the requirements for MOOCs for learners in low bandwidth areas. MOOCs have the potential to overcome the challenges that are faced by the education fraternity concerning access and finance. However, the introduction of MOOCs may not be a reality as long as there is no guideline for them to be used in the low bandwidth areas of the developing countries.

MOOCs are highly recognized for their high number of intake and free offering of the courses (Liyanagunawardena et al., 2013). With the advantages that the MOOCs come with, they are not featuring in developing countries. Gamage et al. (2015) also conducted a study on e-learning in resource-constrained countries and found that low quality of videos or visual outputs was one of the major challenge users were facing, due to bandwidth limitations because of the low speed network.

Yang et al. (2017) Argue that, categorizing MOOCS factors into organizational and technological factors only may overlook other factors that play major roles in the MOOCs systems full implementation process. They emphasize that there are many other factors that may contribute to the success of MOOCs in the post implementation stage. To successfully implement MOOCs Technology, Organization, Environment, individual, social and pedagogical factors need to be considered. Such factors include funding support, ICT infrastructure, attitude, reputation, quality of resources, policies and standards and many others.

Methodology

This study used content analysis to search the literature of factors that hinders the higher education institutions to implement MOOCs. The study reviewed thirty-five scholarly articles that included conference proceedings, journal, web articles and internet magazines. The search terms used included; "MOOCs Implementation", "MOOCs in developing", "MOOCs factors", "MOOCs Implementation factors", "MOOCs and higher education factors", "Challenges of MOOCs Implementation","MOOCs in developing countries" and "failure of MOOCs Implementation","MOOCs Implementation issues". The "AND" operator was used when searching databases.

The study used a descriptive approach which attempts to identify the characteristics of a problem through description. Microsoft excel was used to analyze the results through tabulating the results and to count the frequency of appearance of each factor. The similar factors were categorized and those with the same meaning were renamed and given a common name. Many factors were removed and the remaining were placed in five categories. Table 1 exhibits the factors corresponded with their frequency of appearance in the reviewed literature. These factors were then categorized as Technological, organizational, environmental, individual, social and pedagogical. In the process of categorization, it was established that some factors were named differently but actually carry the same meaning. Such factors were regrouped and given one name. The identified factors in their respective categories as well as frequencies of appearance are as presented in Table 1. Factors with lower frequency than 5 were removed.

Table 1. MOOCs implementation factors frequencies

Category	Factor	Freq
Organizational	Scale of Massiveness	36
	Policies	34

	Technological Support	33
	Funding	33
	Openness	21
	Credits Recognition	20
	Change Management	15
Technological	Infrastructure	33
	Network Reliability	32
	Hardware	31
	Software	30
	Maintaining and upgrading hardware and software required for e-learning	30
	Technical Support	29
	Internet Quality	29
	System Quality	27
	Online Platform	27
	Perceived Ease of Use	25
Environmental	Top Management Support	37
	Vendor Support	32
	Geographical Location	27
	Government and Political support	20
	Policies and standards	16
Individual	Attitude	40
	Experience	34
	Trust	31
	Motivation	30
	Awareness	30
	Behavior	21
Social	Reputation	28
	Localization	26
	Focus of subjects	26
	New experience view	20
	Learning view	18
	Acquaintances	12
Pedagogical	Flexibility	33
	Quality Resources	31
	Content development organization and Access	30
	Interactivity and Peer-to-peer pedagogy	29

	Focus of Subjects	28
	Pre-Course Information	20
	Timing	13

Conceptual model

From found factors, a conceptual model was formulated, which shows the factors that influence the implementation of MOOCs in HEIs of the developing country.

- Environment has to be conducive for technologies to be implemented, hence factors like top management support , policies and standards.
- Organizational factors such as funding and technological support have to be considered.
- Technological factors play an important role in the implementation of the implementation of MOOCs.
- Individual factors such as attitude, awareness and many others have to be considered for the free flow of the implementation process.
- Learning views, localization and reputation are some of the social factors which are crucial in the implementation process.
- While dealing with the e-learning platforms, pedagogical factors play an important role in the implementation, factors such as quality resources, flexibility and many others.

The conceptual model is shown in Figure1 below.

Figure1: MOOCs implementation conceptual model

The main goal of this study was to investigate **how MOOCs could improve higher learning institutions in developing countries by reaching the masses that fail to get access to tertiary education.** The deduced model in Figure 1 indicates that Organizational, Technological , pedagogical , Individual, social and environmental factors are cornerstone in implementation of MOOCs in developing countries.

Limitation and future work

The study concentrated on the model for MOOCs implementation in Higher education institutions of the developing countries. Literature states that most of the institutions of higher learning are still lagging behind in the implementation of MOOCs, this calls for a need to therefore to look at the models for MOOCS implementation especially in developing countries.

Conclusion

With the current wave of COVID 19, a worldwide pandemic where learners can no longer converge in lecture rooms or campuses, Massive Open Online Courses (MOOCs) is one of the revolutionary online learning applications that need to be leveraged. By using MOOCs, ICTs connect the world and bring academicians in various universities closer to individuals who are autonomous in remote areas worldwide and learn to study on their own. Due to this trend that is likely to cover the world for quite some period of time, the current MOOCs platforms need to be re-evaluated and restructured to cover all areas be it the urban rich or the rural poor. The realization of many benefits associated with technological innovation related to online learning like MOOCs, necessitates the need to accommodate learners in developing countries that are ever challenged with intermittent networks, irregular power supply, and low bandwidth. The model of this study will aid in the implementation of MOOCs in developing countries .

Acknowledgment

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DHET Conference Compliance Letter (for SA Authors)

To whom it may concern,

The digiTAL 2020 conference was hosted virtually due the COVID-19 pandemic, from Durban South Africa, in association with Victoria Institute of Technology, Australia and e-Assessment Association, UK, from the 3rd to 4th December 2020.

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The conference proceedings aims to disseminate original research and new developments in the field of digital teaching, learning and assessment across multiple disciplines. Complete articles were double blind peer reviewed prior to acceptance for presentation at the conference, and subsequent publication in the proceedings. The related International Standard Book (ISBN) is 978-1-990901-49-2. The target audience of the proceedings are specialists in the field of digital teaching, learning and assessment. More than 60% of contributions published in the conference proceedings emanate from multiple institutions. The conference has an editorial board (see Pg.6) and/or organising committee (see Pg.7), with a significant majority of members beyond a single institution, which is reflective of expertise in the field of digital teaching, learning and assessment.

Regards,

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Date: 31st December 2020