ACADEMICS' KNOWLEDGE OF TECHNOLOGICAL, PEDAGOGICAL AND CONTENT INTEGRATION AT AN OPEN DISTANCE AND E-LEARNING INSTITUTION

by

RENDANI WILSON MALADZHI

Submitted in accordance with the requirements for the degree of

Master of Education

In the subject

Open and Distance Learning

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: Dr Lydia Mbati

DECEMBER 2020

DECLARATION

I declare that ACADEMICS' KNOWLEDGE OF TECHNOLOGICAL, PEDAGOGICAL AND CONTENT INTEGRATION AT AN OPEN DISTANCE AND E-LEARNING INSTITUTION is my own work and the resources quoted and used have been indicated and acknowledged by means of complete references.

01 November 2020

SIGNATURE **DATE**

KEY TERMS: Technology, pedagogy, content, knowledge, e-learning; open and distance learning; College of Science, engineering and technology; online teaching and learning

ABSTRACT

The current study utilised the technological, pedagogical, content and content knowledge (TPACK) framework to determine academics' knowledge on technological and pedagogical integration in teaching and learning in The College at The Institution. The study emanated from the Institution's 2016-2030 Open and Distance e-Learning (ODeL) strategic plan which underlies its transformational process to become an exceptional technological and pedagogically oriented institution of both local and international standing in the field of Distance Education (DE). The Institution has established itself over the years as a giant of distance education and has continued to navigate different avenues through technological means. The existing digital age of the 21st century has required educators to improve their technological, pedagogical and content know-how in order to create a conducive environment for teaching and learning. However, educators have continued to continuously utilise technology for communication and low-level tasks such as word processing or research, but not for curriculum purposes. A quantitative research design was utilised to investigate academics' understanding of pedagogy, content and technology in relation to the teaching and learning environment. Additionally, convenience sampling was appropriate because only academics at the College who were available and willing were invited to take part in the study. Accordingly, all of the academics employed at the College who declared themselves willing were invited to participate in the survey. The survey was conducted through online Microsoft forms. The descriptive statistics (mean, range, standard deviation, factor analysis, chi-square analysis) drawn from Technological, Pedagogical and Content (TPACK) scores were analysed using SPSS (Statistical Package for Social Sciences) version 23. The study also provided a baseline analysis of the College academics' knowledge of Technological, pedagogical and content integration in teaching and learning activities. Additionally, the findings provided direction and recommendations for the College to use in relation to its 2016–2030 strategic plans. The study utilised the TPACK framework, as highlighted earlier, in achieving the set objectives. As such, the primary objective proved that the academics at the College lacked comprehension of what technology integration in teaching would be able to do for the institution of higher learning. However, the TPACK framework remains an appropriate tool to assess technology integration in the teaching and learning environment as, without technology engagement, teaching opportunities fade away. The use of the TPACK framework by educators assists in raising awareness and understanding of teaching context. It is emphasised that the lack of technological knowledge on the part of academics can cause a digital divide when young, incoming students possess high technological skills. This may cause students to begin to undermine academics who are less interested in technology and can destabilise the teaching and learning environment. The results of the survey indicated a lack of awareness on the part of academics of the TPACK framework that may aid with technology, pedagogy and content knowledge. The study recommends that further studies be undertaken in the area of technology, pedagogy and content integration within other institutions of higher education.

OPSOMMING

AKADEMICI SE KENNIS VAN TEGNOLOGIESE, PEDAGOGIESE EN INHOUDSINTEGRERING BY 'N OOPAFSTAND- EN E-LEER-INSTELLING

In hierdie studie is die tegnologiese, pedagogiese, inhoud- en inhoudskennis (TPACK)-raamwerk ingespan om akademici se kennis van tegnologiese en pedagogiese integrering in onderrig en leer by Die Skool aan Die Instelling te bepaal. Die studie was 'n uitvloeisel van die Instelling se strategiese plan vir 2016–2030 rakende Oop- en Afstands- e-leer (ODeL), wat onderliggend is tot die transformasionele proses om 'n uitsonderlike tegnologies en pedagogies georiënteerde instelling met plaaslike sowel as internasionale status in die veld van afstandsonderrig te word. Die Instelling het oor die jare gevestig geraak as 'n reus in afstandsonderrig en het voortgegaan om verskillende weë met behulp van tegnologie te navigeer. Die huidige digitale era van die 21ste eeu het van opvoeders vereis om hul tegnologiese, pedagogiese en inhoudskennis te verbeter ten einde 'n omgewing te skep wat bevorderlik vir onderrig en leer is. Opvoeders het egter voortgegaan om deurlopend tegnologie te benut vir kommunikasie en laevlaktake soos woordverwerking of navorsing, maar nie vir kurrikulumdoeleindes nie. 'n Kwantitatiewe navorsingsontwerp is gebruik om akademici se begrip van pedagogie, inhoud en tegnologie in verhouding tot die onderrig- en leeromgewing te ondersoek. Daarbenewens was gerieflikheidsteekproefneming geskik omdat slegs akademici verbonde aan die Skool, wat beskikbaar en bereidwillig was, genooi is om aan die studie deel te neem. Die opname is deur middel van aanlyn Microsoft-vorms gedoen. Die beskrywende statistiek (gemiddelde, variasiewydte, standaardafwyking, faktorontleding, chi-kwadraatontleding) op grond van tegnologiese, pedagogiese, en inhoud (TPACK)-tellings is ontleed met behulp van SPSS (Statistical Package for Social Sciences), weergawe 23. Die studie het ook 'n basislynontleding van die akademici by die Skool, se kennis van tegnologiese, pedagogiese en inhoudsintegrering in onderrig- en leeraktiwiteite gebied. Die bevindings het ook rigting en aanbevelings gelewer wat die Skool kan gebruik ten opsigte van sy strategiese planne vir 2016–2030. Soos vroeër genoem, is die TPACK-raamwerk in hierdie studie gebruik om die doelwitte wat gestel is, te bereik. As sodanig het die primêre doelwit bewys dat die akademici by die Skool nie begryp hoe waardevol tegnologie-integrering in onderrig kan wees vir die hoëronderriginstelling nie. Die TPACK-raamwerk bly egter 'n geskikte hulpmiddel om integrering in die onderrig- en leeromgewing te assesseer – trouens, sonder tegnologiebenutting gaan kosbare geleenthede vir onderrig verlore. Opvoeders se gebruik van die TPACK-raamwerk dra by tot bewustheid en begrip van die onderrigkonteks. Daar word beklemtoon dat akademici se gebrek aan tegnologiese kennis 'n digitale skeiding kan veroorsaak wanneer jong, nuwe studente oor 'n hoë vlak van tegniese vaardigheid beskik. Dit kan daartoe lei dat studente begin om akademici wat nie soseer in tegnologie belangstel nie, te ondermyn, en dit kan die onderrig- en leeromgewing destabiliseer. Die resultate van die opname dui daarop dat 'n bewustheid van die TPACK-raamwerk wat kan bydra tot kennis van tegnologie, pedagogie en inhoud, by akademici ontbreek. Daar word aanbeveel dat verdere studies oor die onderwerp van tegnologie, pedagogie en inhoudsintegrering onderneem word by ander hoëronderriginstellings.

MANWELEDZO

NḐIVHO YA AKADEMIKI YA THEKHINOLODZHI NA U SHUMISWA HA ZWI RE NGOMU KHA ZWIIMISWA ZWA U FUNZWA U KULE NA U GUDA NGA KHA LUBUVHISIA

Ṱhoḓisiso ya zwino yo shumisa furemiweke ya thekhinoḽodzhi, pfunzo nḓivho na thyeori dza nḓivho (TPACK) u ta nḓivho ya vhoraakademi kha ṱhanganelano ya thekhinoḽodzhi na pfunzo kha u funza na u guda kha Khoḽidzhi kha Tshiimiswa. Ṱhoḓisiso i bva kha pulane ya tshiṱirathedzhi ya 2016-2030 ya Tshiimiswa tsha u Guda u kule na nga kha Lubuvhisia (ODeL) tshine tsha ṱuṱuwedza kuitele kwatsho kwa tshanduko u vha tshiimiswa tsho ḓisendekaho tshoṱhe nga thekhinoḽodzhi na pfunzo kha vhuvhili ha vhuimo hapo na ha dzitshaka kha sia ḽa Pfunzo ya u guda u Kule (DE). Tshiimiswa tsho ḓibveledzisa tshone tshiṋe lwa miṅwaha sa tshihulwanesa kha pfunzo ya u guda u kule na u bvela phanḓa na u tshimbidza masia o fhambanaho nga nḓila ya thekhinoḽodzhi. Vhukale vhu re hone ha didzhithala ha ḓaṅwaha 21 ho ṱoḓa vhagudisi uri vha khwinise thekhinoḽodzhi yavho, pfunzo na nḓivho ya uri vha zwi itisa hani u itela u bveledza vhupo havhuḓi ha u funza na u guda. Naho zwo ralo, vhagudisi vho bvela phanḓa na u shumisa thekhinoḽodzhi kha vhudavhidzani na mishumo ya ḽeveḽe ya fhasi i ngaho ya u bveledza maṅwalwa kana ṱhoḓisiso, fhedzi hu sa itelwi ndivho dza kharikhuḽamu. Ho shumiswa kuitele kwa ṱhoḓisiso ya khwanthithathivi u ṱoḓisisa vhoraakademi kha kupfesesele kwa pfunzo, nḓivho na thekhinoḽodzhi zwi tshi elana na vhupo ha u guda na u funza. U ḓadzisa kha zwenezwo, tsumbonanguludzwa dza u nanga vhadzheneleli nga u vha tsinisa yo tea ngauri ndi vhoraakademi fhedzi vha Khoḽidzhi vhe vha wanala na u takalela vho rambiwa na u shela mulenzhe kha ngudo. Nga yeneyo nḓila, vhashumi vhoṱhe vha vhoraakademi vhane vha shuma kha Khoḽidzhi vhe vha bvisela khagala uri vha khou takalela vho rambiwa u dzhenelela kha ṱhoḓisiso. Ṱhoḓisiso yo tshimbidzwa nga kha lubuvhisia nga nḓila dza Microsoft. Manweledzo a data (tshikati, phambano, tshivhalo tsha u fhambana, u saukanya tshivhalo, khonadzeo ya ndingo dzine dza khou lavhelelwa) yo bviswa kha Thekhinoḽodzhi, Pfunzo na zwi re ngomu (TPACK) zwikoro zwo saukanya hu tshi khou shumiswa SPSS (Statistical Package for Social Sciences) vesheni 23. Ngudo yo dovha ya ṋetshedza u saukanya ha mutheo ha Khoḽidzhi ha nḓivho ya vhoraakademi ya Thekhinoḽodzhi, pfunzo na u ṱanganela ha nḓivho kha mishumo ya u funza na u guda. U ḓadzisa kha zwenezwo, mawanwa o ṋetshedza vhuyo na themendelo ya Khoḽidzhi u shumisa zwi tshi elana na pulane ya tshiṱirathedzhi tshayo tsha 2016–2030. Ngudo yo shumisa furemiweke ya TPACK, sa zwo ombedzelwaho u thomani, u swikelela zwipikwa zwo vhewaho. Nga yeneyo nḓila, tshipikwa tshihulwane tsho khwaṱhisedza uri vhoraakademi vha Khoḽidzhi a vha na nḓivho ya uri u ṱanganelana ha thekhinoḽodzhi kha u funza zwi nga thusa hani tshiimiswa tsha pfunzo ya nṱha. Naho zwo ralo, furemiweke ya TPACK i dzula i tshishumiswa tsho teaho u linga u ṱanganela ha thekhinoḽodzhi kha vhupo ha u funza na u guda sa, arali ha sa vha na u dzhenelela ha thekhinoḽodzhi, zwikhala zwa u funza zwi ḓo fhela. U shumiswa ha furemiweke ya TPACK nga vhagudisi zwi thusa kha u ita ngafhadzo na u pfesesa nyimele ya pfunzo. Ho ombedzelwa uri u shaya nḓivho ya thekhinoḽodzhi kha tshipiḓa tsha vhoraakademi zwi nga vhanga u khethekana ha didzhithala musi vhaswa, vha matshudeni vha tshi ḓa vhe na zwikili zwa nṱha zwa thekhinoḽodzhi. Hezwi zwi nga ita uri matshudeni vha thome u dzhiela fhasi vhoraakademi

vhane vha vha na dzangalelo ḽiṱuku kha thekhinoḽodzhi na uri vha nga thithisa vhupo ha u guda na u funza. Mvelelo dza ṱhoḓisiso dzi sumbedza ṱhahalelo ya ngafhadzo kha vhoraakademi ya furemiweke ya TPACK ine ya nga thusa, pfunzo na thyeori ya nḓivho. Ṱhoḓisiso yo themendela uri hu fanela u itwa dziṅwe ngudo kha sia ḽa thekhinoḽodzhi, pfunzo na ṱhanganelano ya nḓivho kha zwiṅwe zwiimiswa zwa pfunzo ya nṱha.

DEDICATION

I dedicate this thesis to the God of Major 1, the God who never sleeps nor slumbers, the God who made everything possible for me to complete this journey even when I was overwhelmed by many responsibilities including the workload.

I also dedicate this thesis to my wife for her continuous support throughout the journey.

ACKNOWLEDGEMENTS

I would like to direct my gratitude to my diligent supervisor, who showed relentless support through her coaching skills and her kindness. Her commitment to the to teaching and learning profession made this journey an interesting one for me. Her timely feedback kept me going and focussed.

I would also like to thank Prof Minnaar A who guided me through my proposal stage. She has the greatest sense of humour and passion for teaching and learning.

I also wish to thank the participants at the College for participating in this study so that it became meaningful and relevant and most informative.

Finally, I would like to thank all the stakeholders who assisted me in various activities from obtaining the ethical clearance to the permission to involve the Institution academics.

LIST OF ACRONYMS AND ABBREVIATIONS

This section explains all terms, which brought meaningful contributions in the study.

Blended learning: is the utilisation of multiple teaching and learning strategies, a range of technologies in combination with face-to-face interaction and the deployment of both physical and virtual resources (Unisa, 2015).

Content Knowledge (CK): Knowledge about the actual subject matter being taught (Mishra & Koehler, 2006: 1017-1054); Koehler & Mishra, 2009:60-70).

Connectivism: Siemens (2005:1-5) defines the theory as a learning theory for the digital age and as such describes how students use personalised, online and collaborative tools to learn in different ways to previous generations of students. The continuous learning process requires the web for connections in order to stay up to date with content as it changes.

Constructivism: is a paradigm that perceives learning as an active, constructive process where learners construct new ideas or concepts based upon their current/past knowledge, social interactions, and motivation (Tsou, 2006:203-224).

Distance education (DE): is characterised by teaching and learning coordinated by media – students and their teachers do not meet face to face (Holmberg, 1995:47–53).

E-learning: According to Minnaar (2011:88–108), e-learning amongst other things includes the use of the internet for accessing learning materials, interacting with learning content and with instructors and students to obtain support during the learning process in order to gain knowledge and personal meaning and to grow.

Information Communication Technologies (ICTs): is seen as an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and video conferencing and distance learning (Arnold, Gibbs & Shepherd, in press). It is generally related to those technologies that were used for accessing, gathering, manipulating and presenting or communicating information (Lloyd, 2005:170–179).

ODL: is a learning model that aims to bridge the time, geographical, economic, social,

educational and communication distance between the institutions and the students, the academics and the students, the learning materials and the students and amongst the students (Ngubane-Mokiwa & Letseka, 2015:1-16).

Open Distance and e-Learning (ODeL): The framework places emphasis on the fact that teaching and learning can effectively take place when it is coordinated by modern electronic technologies and other digital facilities. Additionally, students can easily access content materials and interact with their lecturers without the necessity of physical contact (Ngubane-Mokiwa & Letseka, 2015:1-16).

Pedagogical Knowledge (PK): Knowledge about the theories and methods of teaching (Shulman, 1986:4-14; Koehler & Mishra, 2009:60-70).

Pedagogical Content Knowledge (PCK): Knowledge that blends both the pedagogical and content knowledge, understanding teaching methods that best teach the particular content (Shulman, 1986:4-14; Koehler & Mishra, 2009:60-70).

Technological Knowledge (TK): Knowledge about the various technologies a teacher may use (Mishra & Koehler, 2006: 1017-1054); Koehler & Mishra, 2009:60-70).

Technological Content Knowledge (TCK): Knowledge that understands the type of technology that is most appropriate to the content taught (Koehler & Mishra, 2009:60-70).

Technological Pedagogical Knowledge (TPK): Knowledge a teacher needs to integrate technology effectively into the curriculum (Koehler & Mishra, 2009:60-70).

Technological Pedagogical and Content Knowledge (TPACK): is where the three types of knowledge intersect representing the connection of all three types of knowledge (Koehler & Mishra, 2009:60-70).

Web 2.0 tools: are tools in the form of study guides, tutorials, assignments video conferencing, blogs, social media, online discussion forums, etc. (Mbatha, 2014: 257–274; Chimo, 2012:1-54; Majid, 2014:88-94; Jimoyiannis *et al.*, 2013: 248-267).

CEDU: College of Education

CMC: Computer mediated communication

MOOCs: Massive open online courses

OERs: Open Education Resources

OECD: Organisation for Economic Co-operation and Development

UMUC: University of Maryland University College

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

PURPOSE, AIM AND RATIONALE OF THE RESEARCH STUDY

1.1 INTRODUCTORY BACKGROUND AND CONTEXT OF THE STUDY

The UNESCO Education for All (EFA) movement, which represents almost 164 national governments that offer quality basic education for learners, was behind the open education drive (Bates, 2015:1689–1699). Bates (2015:1689–1699) further highlights that there are still millions of students around the world without access to education because of financial exclusions. Approximately 35-60 percent of learners within the Organisation for Economic Co-operation and Development (OECD) countries are advancing to institutions of higher learning from secondary schools. The acquired qualifications from institutions of higher learning are utilized as stepping-stones for the graduates to secure well-paying jobs (Bates, 2015:1689–1699). Hence, the increased demand for full and free open access to education in institutions of higher learning. Bates (2015:1689–1699) further mentions that open education initially caters for non-traditional students such as working students, stay-at-home students and disabled students. In the view of Hermans (2015:144), open education is a significant concept in the educational fraternity that allows for extreme flexibility to potential students. Bates (2015:1689–1699) adds that open education is characterised by affordability due to its nature of low costs; accessibility to college or university by everyone without barriers to learning; no preceding qualifications to study required; no discrimination by gender, age or religion or even disabilities. Open education also allows students to exercise their own self-determination regarding their study goals and the composition of programmes (cross-disciplinary) without barriers to enrolment, thus creating a high level of flexibility for students (Hermans, 2015:144). In Britain, open education became a state-funded public entity, whereby the established Act made the provision that education was payable from government taxes (Bates, 2015:1689–1699). There are many instances where parents cannot afford to pay towards their children's education (Bates, 2015:1689–1699), and no students should be excluded from education opportunities due to financial reasons. In fact, various developed countries of the world including South Africa, are currently embracing public funded education to accommodate children up to the age of 18.

Please note that, for the sake of ethical consideration, the institution and the college where the research study took place will be referred as “the Institution” and “the College” respectively.

The Institution is the largest Open, Distance and eLearning comprehensive higher education institution in Africa, with a student population of more than 350,000. Over the years, The Institution was known to cater for non-traditional students but things have taken a different turn all due to young students coming straight from schools who cannot gain access into traditional institutions because of stringent acceptance rules and the costs of conventional higher education institutions. With the changing student demographic and global developments in the field of higher education, The Institution academics needed to be technologically and pedagogically ready to meet the needs of the diverse market. Modern developments in technology, the universal evolution of devices, and the intensification of Internet users worldwide has led to new teaching and learning approaches such as Massive Open and Online Courses (MOOCs).The increasing use of Open Education Resources (OER) (Lim-fei, 2017). Lim-fei (2017:1-10) further emphasises that openness in education has brought about innovative methods to the development, dissemination, and utilisation of knowledge in teaching, learning and research. Thus, the importance for educators to be competent in technological, pedagogical and content knowledge to facilitate quality education for their students. It is important that educators design curriculum and study material with appropriate media conducive for teaching and learning in this 21st century. As a result, students should be empowered with prevalent pedagogies, technologies, and learning assessment criteria relevant in this 21st century digital age (Mbati, 2013). This is the reason why Bates (2015:1689–1699) mentions that no one should to be denied access to education when technology is accessible. Hence, some institutions offer qualifications that are fully online, while others offer blended programmes which entail a combination of face-to-face and online facilitation. This allows students to choose the mode of teaching and learning based on the institutions according to the institutions and programmes offered. Bates (2015:1689–1699) further states that true open universities were likely to remain behind the leading edge of educational applications of technology. While online blended and distance education institutions offer flexible learning options, many suffer the reputation and history of high levels of attrition. As a result, the completion rates in these institutions are amongst the lowest. As highlighted by Woodley and Simpson (2013: 520), the UK OU’s degree completion rate is 22 percent, but this is still higher for full degree programmes than for most single MOOC courses. Literature reveals that while many higher education institutions have been in existence for many years, some academics

lack the skills to effectively use technology to improve the quality of teaching and learning (Fairchild, Meiners &Violette, 2016). This emphasises the importance of technological, pedagogical and content integration by any institution wishing to remain relevant in this digital age.

In the South African context, both the freedom charter of 1987 and the constitution of 1996 make provisions for open education: "Everyone has the right (a) to a basic education, including adult basic education; and (b) to further education, which the state, through reasonable measures, must make progressively available and accessible." It further clarifies that basic education is a fundamental right while further education remains progressive (Bernstein, 1987:672-677: Parker, 2015:3). To enforce free education for all, the South African universities went on strikes between 2016 and 2017. The revolts prompted the then president of South Africa, President Jacob Zuma to establish a commission to get closure. In December 2017, President Jacob Zuma made an announcement in the 54th African National Conference's elective congress that as from 2018 the government will subsidise free higher education for poor and working-class students. It meant that all currently enrolled Technical and Vocational Education and Training (TVET) college or university students from South African households with combined annual income of less than R350 000 were eligible (Jacob, Siyathuthuka & Gcis, 2017; Parker, 2015:3). That was an indication that governments of the world were doing everything they could to support education accessibility.

The Council on Higher Education (2014:118) pronounced that the provision of ICT and its connectivity alone could not provide the much-needed quality distance education without the improvement in teaching and learning. It mentioned that factors such as family commitment, especially among women in the developing countries encouraged people to consider Open distance and eLearning (ODeL) as an option to further their studies (Nyerere, Gravenir & Mse, 2012). ODeL is reliant on modern electronic technologies and other digital facilities to facilitate teaching and learning (Ngubane-Mokiwa & Letseka, 2015:129–142). According to Nyerere *et al*. (2012), ODeL became a transitional tool to close a gap that had existed within the educational space. Pityana (2007), mentioned that ODeL became a viable cost-effective means for providing education to willing people even in the place inflicted by scarce resources. Nevertheless, in those developing countries, internet connectivity continued to be a continual challenge to push forward the ODeL agenda. Lack of trained professionals to support the course

of national distance education implementation continued to be an added disadvantage (Nyerere *et al*., 2012). According to Arinto (2012), ODeL was characterised by the attitude of open learning adopted by the open universities where distance education (DE) and e-learning pedagogies were experienced in various forms such as flexible learning, independent learning and the building of learning communities.

The current study aimed to employ technological knowledge, pedagogical knowledge, content knowledge and the technological pedagogical content knowledge (TPACK) framework to determine academics' knowledge on technological, pedagogical and content integration in teaching and learning in the The College and at the Institution. At the Institution, teaching and learning content adopted Web 2.0 tools which differed from face-to-face traditional institutions. Web 2.0 tools took the form of video conferencing, blogs, google docs, wikis, social media, etc. (Mbatha, 2013:543-552; Chimo, 2012:1-54; Majid, 2014:88-94). In the view of Majid (2014:88-94), Web 2.0 tools offer on-demand applications for students' accessibility in knowledge sharing and more importantly knowledge generation within a distributed learning environment. Furthermore, Web 2.0 tools provide advantages such as easier and faster access to information when and where it is needed; sharing accumulated experiences and resources; and compatibility with the elements of the educational field and the existing contextual dynamics (Majid, 2014:88-94). At the Institution, academics conduct their teaching and learning through a SAKAI based Learning Management System, where study materials may be accessed and interactive tools such as video conferencing, social media and discussion forums are available. In addition, the LMS platform allows academics to create assessments plans, upload tutorial letters, and communicate with students etc. Chimo (2012:1-54) argues that the Web 2.0 technologies can spread the learning environment beyond the classroom and the school day. Students are in the position to be able to conduct further discussions about their lessons with their peers. Web 2.0 also allows students to interact with learning content, fellow students, learning facilitators and the learning institution. The utilisation of technology by students depends greatly on its adoption by their educators.

1.2 RATIONALE OF THE STUDY

This dissertation reports on a study based on the Institution's 2016-2030 Open and Distance e-Learning (ODeL) strategic plan (University of South Africa, 2015) in transforming the Institution to become a world-class technology-oriented institution in both local and

international standing with regards to ODeL provision. The Institution's transition from a Distance Education (DE) institution emanated from correspondence mode of delivery over the years to the current ODeL with reference to the five generations of distance education (Bates, 2008:218-235; Heydenrych & Prinsloo, 2010:5-26). In table 1.1. Pityana (2007:1-11), shows how the Institution successfully moved from first level to fifth level of the five generations of distance education for teaching and learning. The Institution's 2016-2030 strategic plan stressed technology integration as an overriding factor in the creation of a learning management system (LMS) platform in gaining a competitive edge as a dynamic institution (University of South Africa, 2015). Over the years, the Institution has shown dramatic technological progress from the point of reference of the five generations of distance education. Distance education has remained a constant paradigm, but the methods of execution differ from one institution to the other. In the earlier days, students-to-lecturers interaction was limited to study materials, assignments and venue-based examinations as seen through level one until level four of five generations (Bates, 2008: 218-235; Heydenrych & Prinsloo, 2010:5-26; Mbati, 2013) as reflected in table 1.1 below. The transition through the five generations of distance education over the years emphasised the medium of delivery from text and images to sound and video, to live television broadcasting, to Web 2.0 interactive online technologies. The introduction of web technology made it possible for students-to-students, students-to-content and students-to-lecturers interaction to feature in the teaching and learning fraternity as seen in level five of the five generations of distance education (Bates, 2008:218-235; Heydenrych & Prinsloo, 2010:5-26; Mbati, 2013) in table 1.1. However, the successful application of distance education depends on self-limiting-mindsets coupled with the reluctance to move out of our comfort zones into the new territory (Pityana, 2007). The Institution embraced the blended mode (Unisa, 2015) of delivery to cater for its diverse student community. The Institution's 2016-2030 ODeL strategic plan shows the Institution's intention to be fully online at some point in the future. However, accessibility and connectivity, particularly for students, remained a challenge to consider (Heydenrych & Prinsloo, 2010:5-26). Therefore, the Institution emphasizes the need for all academics to transform its ODeL 2030 strategic plan to serve its student community better.

Educators play a fundamental role in the effective integration of technology for teaching and learning (Teo & Zhou, 2017: 513-527). Based on the history of the Institution and the transition regarding distance and learning, it was expected from every academic staff member to be

supportive towards technology and pedagogy to enhance teaching and learning. Hence, the current study focussed on determining the Institution's academics' knowledge regarding technological, pedagogical and content integration.

Table 1.1: Five generations of distance education

Generation	Pedagogy and Interaction	Medium	Production	Storage	Delivery
1st (1451–1916 CE)	*Behaviourism*. Content based and dominated by limitations of print technology – self-pacing – mass delivery	Text and images – the advent of film	Printing press, manual design and recording	Books and letters	Mail system
2nd (1918– 1955)	*Behaviourism and cognitivism*. Content based with limited interaction – mass delivery of DE and controlled access based on gender, class/caste, culture and age	Text, images, sound and video (film) – the start of instructional television	Printing press, sound and video/film recording, manual and computer design/ programming	Recordings – audio cassettes and video cassettes	Mail system/television/ telephone/sound playback equipment
3rd (1956–-1968)	*Behaviourism/cognitivism/ constructivism*. Mostly asynchronous with limited interaction – mass delivery of DE – computer-aided instruction – computer- assisted learning	Text, images, sound, video, instructional and live television	Printing press, sound and video/film recording an computer design/ programming	Recordings – audio cassettes and video cassettes –storage on discs	Mail system/ television/ telephone/ computers/ video and sound playback equipment – first computers used to send batches of data

Generation	Pedagogy and Interaction	Medium	Production	Storage	Delivery
4th (1969–2005)	*Behaviourism/cognitivism/ constructivism/social constructivism or constructionism enactivism/ connectivism*. Content starting to move away from the university – asynchronous and synchronous interaction – mass delivery becomes problematic and demands for interaction challenge ICTs	Text, images, sound and video			Mail system/ television/telephone/ computers video and sound playback – equipment – computers starting to become a generic device and WWW (internet) as a generic platform
5th (present day)	*Behaviourism/cognitivism/ constructivism/social constructivism/connectivism*. Content starting to move away from the university – asynchronous and synchronous interaction – mass delivery becomes problematic and demands for interaction challenge ICTs	Text, images, sound and video Web 2.0 interactive online technologies	Printing press, sound and video/film recording and computer design/ programming/user involvement Blogs, mini-blogs, chats, email, message boards, online conferencing, social networks, wikis	Digital storage media (CD, DVD, memory sticks, central servers, cloud, hard drives, etc)	Mail system/television/ telephone/computers/ video and sound playback – equipment – computers starting to become generic device and the WWW (internet) as a generic platform Asynchronous and synchronous delivery

Sources: Bates (2008), Heydenrych & Prinsloo (2010:5-26) and Mbati (2013).

1.3 CONSTRUCTIVISM AND CONNECTIVISM LEARNING APPROACHES

The Institution has adopted constructivism as the predominant learning approach for the facilitation of learning (Unisa, 2008). The Constructivism theory, according to Tsou (2006:203-224), was singled out for its distinctive principle that knowledge resided in individuals and was not completely convertible to learners by their teachers. This meant that learners can develop their own skills from their interactions with their teachers. In the case of The Institution, discussion forums allowed academics to use problem-based learning strategies and post some challenging tasks that give students opportunities to engage with each other and share their knowledge. In the end students spend most of their time learning on their own and thereby developing learning skills. Academics coordinate the learning process while students take ownership of the learning process. However, for that to happen lecturers are required to be comfortable with the evolving technology coupled with pedagogy in order to develop such tasks. In addition, Vygotsky's Theory of Social-Constructivism, emphasises the student's full participation in teaching and learning without completely depending on academics.

In the view of Vygotsky (1978:34–40), educators play a mediating role for teaching and learning to take place. Educators remain role players encouraging engagements and making sure that the necessary student activities for them to learn did take place. It is always expected that academics initiate the learning process and thereafter, students develop it further. Technology in the digital age means swiftly coordinating teaching and learning to take place, with the educators spearheading the process. Besides constructivism, the Institution, with assistance of George Siemens, began to embrace the connectivism theory to boost teaching and learning in the digital space. Connectivism describes learning as a continual process, which occurs in different settings including communities of practice, personal networks and workplace tasks. Siemens (2017) acknowledges that knowledge was created beyond the level of individual human participants, and constantly shifts and changes. Therefore, it is the connections and the way information flow that results in knowledge existing beyond the individual (Siemens, 2017). In the view of Siemens (2017), connectivism is a learning theory for the digital age where students use personalised, online and collaborative tools to learn in different ways from previous generations of students. Mafenya (2016), interestingly, cited Siemens (2005:3) who indicates that traditional theories such as behaviourism, cognitivism, and constructivism are constraints in conjunction with connectivism due to the recent technological developments.

Anderson and Dron (2011) are of the view that connectivism adds on the constructivist model of learning, which suggests that the teaching and learning process allows students to remain at the centre of learning while constructing knowledge. Siemens (2017) and Downes (2007) further acknowledge that the current breed of students in the digital age are submerged in a technological environment with little separation between formal learning, social networks, recreation, and employment. These students prefer their graphics before text (Prensky, 2011:2). It appears that connectivism has gained popularity due to its ability to help students engage in online discussion groups, where they freely share information via the internet. Currently, the Institution is fully committed to the development and the utilisation of MOOCs. In different platforms and workshops, the Institution's staff members are encouraged to develop their own MOOCs when they could not find any relevant ones already available. According to Bates (2018), internet connectivity allows students to stay up to date with content as it changes with time. Hence, the current study emphasises relevant theories such as constructivism, social constructivism and connectivism with the anticipation to create a conducive environment for teaching and learning in the 21st century. However, the environment provides educators with dynamic mindsets to collaborate with digitally minded students.

At the College, lecturers post learning activities on LMS discussion platforms for students to interact with each other and with lecturers as well. However, students were reluctant to participate in the discussion platforms because of being afraid of other students' views (De Villiers & Pretorius, 2013: 56-70). In addition, some students prefer to become observers while learning from other students' viewpoints within the discussion forum (De Villiers & Pretorius, 2013:56-70). De Villiers and Pretorius (2013: 56-70), indicated that some students enjoyed discussion forums as they learned from each other's opinions and boosted their confidence.

1.4 STATEMENT OF THE PROBLEM

The current study sought to address the challenges faced by academic staff at the Institution with regard to technology integration for teaching and learning (Isabirye, 2015). The literature revealed that those academics were not using the available educational technology for teaching and learning effectively (Mafenya, 2016). Additionally, those educators continuously utilised technology for communication and low-level tasks such as word

processing and research (An & Reigeluth, 2011:54-62). It was indicative that those educators were not prepared to integrate technology into their curriculums (Fontanilla, 2016). The literature on educational technologies (ICT) and eLearning is widely available from an international perspectives (Hlagala, 2015), but from a South African ODeL perspective literature is limited and emerging slowly. Some speculate that academics' reluctance with regards to technological and pedagogical integration at the Institution is related to academics' resistance to change, and others perceived technology as a time waster, amongst other things (Isabirye, 2015:321; Gumbo, 2016). However, the Institution could not make decisions on its future based on assumptions. They must have facts, hence the need for the current study to ascertain academics' knowledge on technology and pedagogical integration. If these challenges are not resolved by the current study, the Institution may continue to struggle to offer appropriate skills to its students and that may be detrimental to the future of teaching and learning.

1.5 RESEARCH QUESTIONS

The overarching question this research sought to address was:

What is the baseline knowledge the College academics possessed regarding TPACK integration in teaching and learning?

The following sub-questions guided the research:

- Do academics at the College possess technological knowledge (TK) to create a conducive environment for teaching and learning at an ODeL?
- How much content knowledge (CK) do the College academics have in relation to teaching and learning at an ODeL environment?
- How aware are the College academics' pedagogical knowledge (PK) in creating a conducive environment for teaching and learning at an ODeL?
- How much knowledge do the College academics' command to integrate technological, pedagogical and content knowledge (TAPCK) within teaching and learning (ODeL) institution?

1.6 PURPOSE, AIM AND OBJECTIVES OF THE STUDY

The primary research objective is to identify the baseline knowledge the College academics possessed regarding TPACK integration in teaching and learning. In order to achieve this, the identified questions assisted the researcher to plan the execution of the current study by laying out the following sub-objectives:

- To determine if the College academics possessed technological knowledge to create a conducive environment for teaching and learning at an ODeL institution.
- To determine if the College academics possessed content knowledge to create a conducive environment for teaching and learning at an ODeL institution.
- To determine if the College academics possessed pedagogical knowledge to create a conducive environment for teaching and learning at an ODeL institution.
- To identify an effective way of integrating technological, pedagogical and content knowledge with teaching and learning for the ODeL institution.

1.7 RESEARCH METHODOLOGY AND DESIGN

The study, as indicated earlier, sought to determine the academics' knowledge on technological and pedagogical integration in teaching and learning activities through TPACK scores. The researcher therefore deliberated on different research approaches and designs first and later justified the appropriate choice for the current study. At first, qualitative research design was deliberated on as an option but deemed inappropriate due to its focus on subjective realities. The mixed methods approach was also considered as an option, but later disqualified because of its inclusion of qualitative characteristics. Furthermore, the mixed methods research approach was an integral fibre for collating and collaborating both quantitative and qualitative data by using distinct designs including both philosophical assumptions and theoretical frameworks (Creswell, 2014). However, the study mainly focused on the academics' knowledge of technological and pedagogical integration, which required only descriptive analysis.

In addition, the current study utilised TPACK scores to determine the academics' knowledge of technological and pedagogical integration at the College. Therefore, the quantitative research design was chosen as appropriate to address the research objectives and answer the research questions due to its non-experimental nature. Furthermore, the characteristics of quantitative methodology such as the questionnaire, instruments, checklists and records

assisted to reveal the academics' understanding regarding pedagogy, content and technology in relation to the teaching and learning environment. According to Atieno (2009:13-181), the quantitative research paradigm was empirical in nature and ensured validity through the process of rigorous clarification. The constructs on the TPACK scores went through testing numerous times for validity and reliably. Hence, the TPACK framework was preferable in technology integration studies.

1.7.1 Research Approach

The survey research method was deemed suitable for this study in order to bring out the attitudes, beliefs and characteristics of a population by examining their frequency and distribution (Creswell, 2014). Furthermore, its ability to gather credible information from numerous people earned popularity, hence its preference in the study in order to obtain appropriate information from the College academics. The study opted for the use of the TPACK framework due to its characteristics and association with technology integration research. The survey approach allowed respondents to evaluate their own knowledge regarding the seven different TPACK domains.

Microsoft Forms, an online survey tool, was preferred because of its advantages of time saving, cost effectiveness and basic data analysis. The preferred method was user friendly since the participants participated in the convenience of their own time and space. The instrument was designed in such a way that the participants needed no more than thirty minutes to complete the survey. Over the years the TPACK framework had successfully gained credibility for educators to effectively integrate technology especially where technology knowledge, pedagogy knowledge and content knowledge were involved (Schmidt *et al*., 2009:123–149). The study required the participants to evaluate their knowledge in the seven different TPACK domains, hence the preferences of research population and sampling as mentioned earlier.

1.7.2 Population and Sampling

The study was conducted at the Institution in the College, where there were about 350 staff members, including both academics and administrators. In the current study, the invitation to participate was extended to all 250 the College academics. Furthermore, nonprobability or convenience sampling was appropriate, because only available and willing academics in the College were invited to take part in the survey. Convenience sampling dealt with the

availability of selected participants (McMillan & Schumacher, 2014:159-163; Creswell, 2014). The study involved as many participants as possible due to the nature of quantitative research (McMillan & Schumacher, 2014:159-163) in order to get credible results. It was believed that the larger the sample the smaller the error expected (McMillan & Schumacher, 2014:159-163). Furthermore, communication only focussed on the 250 participants who responded to the invitation for data collection purposes.

1.7.3 Instrumentation and Data Collection Techniques

The purpose of the study was to determine academics' knowledge towards technology and pedagogical integration in teaching and learning by using the TPACK framework, particularly at the College. The purpose of the questionnaire survey was to determine information that included background and biographical information, knowledge, and behavioural information (Alise & Teddlie, 2010: 103-126). The study was deemed better suited to a questionnaire survey to collect data regarding the technological, pedagogical and content knowledge of the College academics. Quantitative data was collected by means of the TPACK scores developed by Koehler and Mishra (2009:60-70) in order to prove or disprove the hypotheses. As the study used the descriptive survey, no hypothesis was proposed.

The data collection instrument took the form of an online Microsoft forms survey, divided into part 1 and part 2. Part 1 contained biographical information such as gender, age, teaching experience and number of subjects. Whereas, part 2 contained the TPACK survey with 39 questions divided into seven domains. These 38 questions were divided into the seven domains of the TPACK framework [technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK) and technological pedagogical content knowledge (TPACK)]. The quantitative questions were in the form of a five-point Likert scale whereby the participants make only one choice. The five-point Likert scale provided the following options: Strongly Disagree, Disagree, Neither Agree/Disagree, Strongly Agree and Agree. If the participant was uncertain, he/she would then opt for Neither Agree/Disagree. The instruments utilised in this TPACK survey have been through numerous reliability and validity tests.

1.7.4 Data Analysis and Interpretation

The TPACK survey was designed on the 5-point Likert scale, which provided the quantitative data for analysis for each research question. McMillan and Schumacher (2014:159-163) believe that a Likert scale questionnaire is the supreme, most extensively used form of a scaled questionnaire. It is the view of McMillan and Schumacher (2014:159-163) that this scaled questionnaire allows the subjects to place their response on a scale that best reflects their opinions of the statement or question. In addition, Likert scales allow for flexibility in a subject's response (McMillan & Schumacher, 2014:159-163). The researcher believed that the choice of that scale allowed the The College academics to express their choices freely and without any limitations. The descriptive statistics (mean, range, standard deviation, factor analysis, chi-square analysis) from the TPACK scores were analysed using SPSS (Statistical Package for Social Sciences) version 23. As mentioned earlier, Part 1 data comprised biographical information of the participants including age, work experience, gender and number of subjects taught. Different charts were used in the interpretation of the information. Part 2, on the other hand, comprised quantitative statistics such as mean, range, standard deviation, factor analysis, chi-square etc. The analysis of the information from part 1 and 2 was done separately beginning with the biographical data and followed by the quantitative data. The Mann-Whitney U test and Chi-Sqaure test were used to determine the association between TPACK and teaching and learning for the ODeL institution.

The interpretation of the analysis addressed both sets of identified questions. The analysis in all collected data informed the Institution on the direction it should take in the future concerning the College's 2030 strategic plan.

1.7.5 Validity and trustworthiness

According to Creswell (2014), good validity and reliability of scores on instruments lead to meaningful interpretations of data. The TPACK scores had the added advantages of being utilised countless times in different environments. Therefore, the researcher's interpretations took into consideration this fact regarding TPACK constructs and the study of these The College academics. The validity of the survey instrument and its scales referred to the extent to which it measured what it was designed to measure. As guided by Kali, Sagy, Kuflik, Mogilevsky and Maayan-Fanar (2015: 5–17) the researcher addressed the need for content and construct validity through previously designed scales and a panel of TPACK experts and readers. Content validity and the adequacy with which the scale was sampled from the

intended domain, was derived through previously designed scales (Schmidt, Baran, Thompson, Mishra, Koehler & Shin, 2009:123-149). When dealing with a conceptual framework such as TPACK scores, construct validity for the elements of the model must establish all 38 questions and refer them to all the constructs (Archambault & Crippen, 2009:71-88). Using those previously tested scales as models, the researcher modified the questions to address the need for a TPACK survey that highlighted the population of the The College environment. The survey questions were piloted to ten participants for content validity. That exercise assisted the researcher to know whether the participants felt comfortable or not to use the survey instrument.

1.7.6 Reliability of TPACK Survey

According to Fontanilla (2016), reliability is defined as the degree to which the scale of a research instrument remains free of random error and can be depended on in the group that was being tested. In addition, (Pallant, 2011), argued that two commonly used indicators of a scale's reliability are temporal reliability (or test-retest reliability) and internal consistency (Pallant, 2011). TPACK scores have been tested numerous times by various researchers and doctoral candidates for its reliability and validity covering all seven domains (Schmidt *et al*., 2009:123–149; Fontanilla, 2016). The internal consistency through Cronbach Alpha of those constructs were as follows, according to the TPACK founders (Schmidt *et al*.,2009:123–149): TK – 0.86; CK for Social studies – 0.82, for Mathematics –0.83, for Science – 0.78, Literacy – 0.83; PK – 0.87; PCK – 0.87; TPK – 0.93, TCK – 0.86 and TPACK – 0.89. Those were the original internal consistencies of these seven constructs to show their strengths. However, it was preferable that they be tested wherever need arose such as in the current study. The researcher therefore tested those constructs again to make them relevant in the current study using Cronbach's alpha. Values of Cronbach's alpha ranged from 0 to 1. While higher values illustrated greater internal consistency, the smaller number of scales used in this study (less than 10 items for each scale) led to the used of the inter-item correlation values to adjust for the lower Cronbach's alpha values on several scales (Fontanilla, 2016). Therefore, the researcher used the guide of the Cronbach's alpha in order to determine the internal consistency of the constructs in question in the current study.

Cresswell (2014) recommended four steps to prepare and encourage participation especially for the mailed survey. The study adopted the following steps:

The first mail-out was a short advance-notice letter to all members of the sample, followed by the second mail-out for the actual mail survey 1 week after the advance-notice letter, while the third mail-out consisted of a postcard follow-up sent to all members of the sample 4 to 8 days after the initial questionnaire. The fourth mail-out sent to all non-respondents consisted of a personalised cover letter with a handwritten signature, the questionnaire, and an addressed return envelope with postage. The researcher would send the fourth mail-out 3 weeks after the second mail-out. The researcher believed this method made the participants realise the importance of their participation in the study.

1.8 ETHICAL CONSIDERATIONS

This research was guided by the four philosophical principles as identified by (Terre Blanche, M, Durrheim, K and Painter, 2006: 94–100).

- ***Autonomy and respect for the dignity of persons:*** In order to uphold the confidentiality of both the respondents and the institution in this research, the names of both are withheld and inferences to the participants are also avoided.
- ***Non-maleficence:*** The researcher ensured that no harm befell the respondents.
- ***Beneficence:*** The benefits of this research were made clear to the respondents in the participant information sheet.
- **Justice:** Fair respondent selection processes upholding justice were employed. The principle of justice allows the participants to benefit from the findings of the research.

Respondents were issued with a cover letter to an online anonymous web-based survey informing the participant of the purpose of the study (Appendix E) and an informed consent sheet (Appendix F) which acted as a disclaimer, prior to commencement of data collection. The information sheet outlined the potential benefits of the research to the participants. The study was presented to the Institution's ethic review committee for approval. Permission to conduct research using the Institution's staff members and data was then sought from the university.

For the purpose of the current study, lecturers were part of the study since they were in the centre of learning. Lecturers were responsible with developing teaching materials and student assessments and for managing other teaching and learning activities towards a conducive learning environment. The researcher obtained permission to conduct the study from The College Research Directorate after acquiring ethical clearance and permission from the

Institution Ethics Review Committee. The distribution of the survey to all participants (250 College academics) was administered by the ICT department of the Institution in accordance with the Institution Research Permission Subcommittee agreement.

Participating in the current research study was voluntary and with no obligation to consent to participation. Participants who decided to take part in the study, were given an information sheet to read and asked to sign a written consent/assent form if they agreed to participate. These participants were informed of their rights to withdraw from the study at any time without giving any reason and with no risk to themselves. The Microsoft forms survey was designed to allow participants to decline or withdraw at any stage. Due to the nature of this study, it did not carry any direct risk except the 30 minutes away from their work if completing it during office hours.

Participants names and any other identifiable information were not recorded anywhere. Furthermore, the structure of the survey items was such that participants are not identifiable by their responses. The survey data was stored in a personal password-protected computer in the possession of the researcher and would be destroyed five years after the study had been completed.

1.9 LIMITATIONS AND DELIMITATIONS

The fact that the current study was conducted in the College at the Institution limited the scope of the study. In addition, the study catered for quantitative research methods due to its nature of data collection since it aimed at improving the Institution's pedagogic practices through technology integration. The nature of the study allowed both less and more experienced academics to participate in the study equally. Since convenient sampling was utilised, the results might not be generalisable to all similar contexts.

1.11 CHAPTER OUTLINE

Chapter 1 gives an introductory background and the structure of the overall thesis, and the researcher presented, amongst other things, the background and context of the study, the problem statement and the rationale for undertaking the study. In addition, the purpose statement, research objectives, research questions, research methodology, significance of the study, study limitations, delimitations, ethical considerations, and definitions of concepts were

described. As a conclusion to the chapter, content outlined for the remaining chapters were alluded to.

Chapter 2: Literature review and theoretical framework

Chapter 3: Research design and methodology

Chapter 4: Research findings

Chapter 5: Research findings discussions

Chapter 6: Conclusions, recommendations and benefits

1.12 CONCLUSION

The current research study alluded on its purpose of employing technological, pedagogical, content and the technological pedagogical content knowledge (TPACK) framework to determine academics' knowledge on technological, pedagogical and content integration in teaching and learning in the College at the Institution. The research study emanated from technological advancement of teaching and learning such as MOOCs and OERs (Lim-fei, 2017:1-10). In 2016, the Institution introduced the 2016-2030 open distance and e-learning (ODeL) strategic plan as a transformational process to remain an exceptional technological and pedagogical oriented institution in both local and international standing regarding distance education (DE). Over the years, the Institution had established itself as a renowned distance education institution. The research study also demonstrated how the Institution transited through different paradigms of DE (Bates, 2005; Heydenrych & Prinsloo, 2010:5-26 and Mbati, 2013). In the digital age of the 21st century, educators needed to advance technologically and pedagogically in order to create a conducive environment for teaching and learning. However, educators continuously utilised technology for communication and low-level tasks such as word processing (Isabirye, 2015) and, research and not for curriculum purposes.

The identified challenges at the College encouraged the researcher to develop this research question, "*What is the baseline knowledge* the College *academics possess regarding TPACK integration in teaching and learning?"* Therefore, the underlying theme of the developed objectives of the study is to investigate the College academics' knowledge around TPACK framework.

The current study opted for the quantitative research design due to its characteristics for its non-experimental nature. In addition, convenience sampling was deemed appropriate because only available and willing academics at the College, participated in the study. The descriptive statistics (mean, range, standard deviation, factor analysis, chi-square analysis) from Technological, Pedagogical and Content (TPACK) scores were analysed using SPSS (Statistical Package for Social Sciences) version 23. For the sake of the reliability, validity and credibility of the survey instruments, the survey questions were piloted to at least ten participants for testing purposes, irrespective that the framework had been utilised countless times globally. The university ethics committee also granted ethical considerations to undertake the study. Additionally, the findings hoped to provide direction and recommendations that the College could apply regarding its 2016-2030 strategic plans. Finally, but importantly, recommendations on further studies regarding technology and pedagogy integration was in anticipation.

CHAPTER 2

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORKS

2.1 INTRODUCTION

It is of vital importance to mention that the evolution of distance education to the emerging digital age compels institutions of higher learning like the Institution to follow suit in order to remain relevant to their students' communities. The current study acknowledges the transition that is taking place at the Institution regarding technology integration in teaching and learning. The literature review below, paints the historical occurrences regarding technological integration within the ODeL environment and its impact thereof if preparations for the future are misplaced.

2.2 A HISTORICAL VIEW OF TECHNOLOGY USE IN ODeL

The council for higher education forwarded some guidelines that paved the way for the implementation of distance education in this digital age in South Africa (Council on Higher Education, 2014:118). The guidelines emphasised that traditional face-to-face institutions have almost reached their capacity in supporting the full-time students. These students are currently advocating for alternative options for them to further their studies while working or taking care of their families (Council on Higher Education, 2014:118). Distance education has the capability to absorb large numbers of students while offering quality and cost effective education (Council on Higher Education, 2014:118). Council on Higher Education (2014:118) emphasised that information technology proved to have the competence to mediate distance education while providing improved quality education especially in developing countries. In addition, the Council on Higher Education (2014:118) pronounced that the provision of ICT and its connectivity alone could not provide the much-needed quality distance education without the improvement in teaching and learning. Likewise, over the years, The Institution transited from correspondence to ODL and currently to ODeL within the ranks of the fifth generation of distance education as mentioned earlier (Pityana, 2007; Unisa, 2015; Bates, 2005; Heydenrych & Prinsloo, 2010:5-26; and Mbati, 2013).

ODL is a learning model that aimed to bridge the time, geographical, economic, social, educational and communication distance between the institutions and the students, the academics and the students, the learning materials and the students and amongst the students

themselves (Ngubane-Mokiwa & Letseka, 2015:1-16). With blended learning, multiples of teaching and learning strategies that range from various technologies in combination with face-to-face interaction and the deployment of both physical and virtual resources were utilised (Unisa, 2015). Web 2.0 technologies coordinated teaching and learning until thus far, however, some challenges were faced by students without accessibility of the internet. Eventually, ODeL added an element of modern electronic technologies and other digital facilities for teaching and learning to take place everywhere and at any time (Ngubane-Mokiwa & Letseka, 2015:1-16).

Arinto (2012) conducted a study in the University of the Philippines Open University (UPOU) and alluded on how the university has initiated resource-based course development since 2003. In the year 2007, the university ventured into Moodle, an open source Virtual Learning Environment (VLE) that facilitated the creation of courses featuring digital resources and online activities (Arinto, 2012). The initiation of the resource-based course development came about as a supplement for print modules with open educational resources (OER). Additionally, academics at UPOU esteemed and made use of the web tools such as blog sites, media sharing sites, and web-based conferencing applications to improve course delivery (Arinto, 2012). Therefore, the utilisation of those technological advancements convinced the UPOU administrators and the chancellor to call it open and distance e-learning (ODeL). According to Arinto (2012), ODeL characterised the attitude of open learning adopted by the open universities where distance education (DE) and e-learning pedagogies were experienced in various activities such as flexible learning, independent learning and the building of learning communities. This shows that any engagements by academics regarding teaching and learning affect the actions of the top management and they find ways of intervening.

Factors such as family commitment, especially women in the developing countries encouraged people to consider ODeL as an option to further their studies (Nyerere, Gravenir & Mse, 2012). Nyerere *et al*. (2012), elaborated that women faced many more challenges compared to men regarding time and resources for studies. The emergence of ODeL provided opportunities to women to study while in the comfort of their homes. Nyerere *et al*. (2012) further mentioned that technological advances propelled by the growing need for skills developments paved a way for more subjects to be taught at a distance without the confinement of classrooms. Currently, every willing person can upskill themselves without any of the previous boundaries. In the views of Nyerere *et al*. (2012), many African students obtained their qualifications through ODeL institutions from Europe before it emerged in

Africa (Nyerere *et al*., 2012). The existence of the Institution in the African continent has promoted the establishments of other ODeL institutions in countries like Tanzania, Zimbabwe and Nigeria.

In the words of Siemens (2017), this e-learning and networked learning dispensation calls educator to play the curatorial role. This then means that educators play a pivotal role in creating a profound teaching and learning environment. Arinto (2012) put emphasis on the fact that the educators must first identify and recognise the shift from their design role to the designing of learning activities. This shows that teachers continue to play a pivotal role in advocating online learning for learners to learn at ease.

As an initiative for preparing academics to teach in an online environment, Isabirye (2015:321) conducted a qualitative research study at the Institution dealing with staff development for innovative teaching and learning. The study researched the staff development framework focused on Orientation; Learning; Acquisition of skills and Competencies; and Performance indicating that effective staff development requires participants who are initially orientated to the training programme before exposure to authentic learning activities. It was anticipated that every academic would gather some vital online teaching skills and competencies for them to teach online. The study further recommended the enhancement of this framework for a sustainability point of view. This study implies that all the Institution's staff members from that particular period of study going forward would be adequately prepared and eager to teach in an online environment.

Gumbo (2016), following on Isabirye (2015:321), investigated the online learning experiences of the Institution's academics who had completed a master's degree qualification in open and distance learning at the Institution. The study revealed that academics involved in online and distance education must have knowledge of education technology. It further recommended that staff members who underwent technological development training should share their technological experiences in order to enhance the pedagogical practice at the Institution. The study confirmed the importance that academics gain knowledge in education technology.

2.3 A GLOBAL PERSPECTIVE

Other literature reviews on technology and pedagogy integration in teaching and learning focused on the TPACK framework utilised in different countries of the world. Various researchers enhanced the technological pedagogical content knowledge (TPACK) framework in order to integrate technology in teaching and learning environments for the benefit of distance education. The TPACK framework is comprised of domains such as Technological Knowledge (TK), Content knowledge (CK), Pedagogical knowledge (PK), Technological content knowledge (TCK), Technological pedagogical knowledge (TPK), Pedagogical content knowledge (PCK), Technological pedagogical content knowledge (TPACK) (Koehler & Mishra, 2009:60-70). These are general constructs that other researchers utilised, depending on their study requirements.

2.3.1 The Integration of Technology in Pedagogy

For many years the technological pedagogical content knowledge (TPACK) framework remained the worldwide-accepted framework for technology integration in teaching and learning (Ling Koh, Chai & Tay, 2014:20-29). Furthermore, various researchers in technology integration in teaching and learning utilized the framework extensively in the past. The review conducted by Chai, Koh and Tsai (2013:31-51) mentions that almost 70 research articles about TPACK were published between 2003 and 2011 from the Scopus database. Moreover, around 450 articles are accumulated on the TPACK dedicated website (http://tpack.org), as cited in Ling Koh, Chai and Tay (2014:20-29). An additional 135 articles are published on the SSCI-list (Ling *et al*., 2014:20-29). The records continue to show that various researchers adopted TPACK in their studies on integrating technology in teaching and learning, depending on their unique environments. The study concluded that the TPACK framework rightfully provides specifications of knowledge required by teachers during technology integration in teaching and learning practices. The framework specifically indicates the kind of knowledge required by teachers to properly integrate technology into teaching, but not the process itself (Ling *et al*., 2014:20-29). Technology was discovered to be an excellent support for pedagogical improvements in order to meet the revolving needs of the students in the 21st century. Those TPACK reviews contained many references on how successful the framework became. The success implementation of TPACK in those various studies led to consideration of the current study in the Institution's context.

Chang *et al*. (2015: 1236-1249) conducted a study to assess university students' perceptions of their Physics instructors' TPACK development in two contexts. Two universities from China and Taiwan, represented by one educator each, participated in the study. The study investigated students' perceptions on how comprehensively their instructors were using the TPACK framework [subject matter knowledge (SMK), instructional representation and strategies (IRS), knowledge of students' understandings (KSU) and technology integration and application (TIA), technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and technological pedagogical and content knowledge (TPCK)]. The findings of the study revealed that both instructors were enthusiastic and inclined to proceed with lecturing (Chang *et al*., 2015: 1236-1249). The instructor from the University of Taiwan was found to be competent regarding multimedia and Internet technologies in teaching his students. The study indicated his inclination towards technology integration in his teaching and learning. Furthermore, he used relevant examples demonstrating various concepts for students to understand. On the other hand, the instructor from China found to value students' knowledge more (Chang *et al*., 2015: 1236-1249). However, students complained about too many assignments in limited time. Both instructors were found to excel in different things but remained relevant to the needs of their students. The TPACK framework had a positive impact on both instructors by assisting them to serve their students better.

It appears that the TPACK framework, if adhered to, has the capability to sway the instructors in the right direction in enhancing quality in teaching and learning. Academics found suitable strategies for integrating technologies into their teaching spaces for the benefit of their students. However, it required introspection on the side of the academics in order for them to further develop themselves on the technological domain. In the proposed study, many academics based their teaching on technical engineering knowledge, but lacked proper teaching methods or pedagogy. Academics seemed to have enough knowledge about the subject, but without the expertise to disseminate the knowledge. The challenge continued when it came to the choice of technology in order to propagate the knowledge to the students. Thus, the importance of the current study investigated the academics knowledge on technology, pedagogy and content integration in teaching and learning by means of TPACK scores.

Similar to other researchers, Akman and Güven (2015:1-10) utilised the TPACK framework to develop a scale to analyse the technological, pedagogical and content knowledge and self-efficacy perceptions of the social sciences teachers and teacher candidates. They referred to other countries already advancing in integrating technology into the teaching and learning environment. In Portugal, laptops and content in the digital mode are made available to the students. The TPACK framework also used successfully in Korea, but failed in Turkey (Akman & Güven, 2015:1-10). The failure to implement the TPACK framework in Turkey was due to a lack of intersection between technology, pedagogy and content knowledge. It was critical for educators to identify the meaning of each element so that their interface can make sense. The seven aspects considered in that particular study were as follows: technological knowledge (TK), pedagogical knowledge size (PK), content knowledge (CK), content and pedagogic knowledge (CPK), technology and pedagogical knowledge (TPK), technological knowledge (CTK), technological pedagogy and content knowledge (TPACK). The findings from the study affirmed the importance of all three aspects (technological, pedagogical and content knowledge), which meant that those depicted aspects were inseparable if one wished to integrate ICT successfully into teaching and learning practices. It was thus important that all educators should develop positive attitude towards technology in order to have a good and balanced teaching and learning environment.

In a study conducted by Fontanilla (2016) which compared the novice teachers with experienced teachers regarding readiness to integrate technology, it was indicated that even though technology had gained the distinction of being important in education it had failed to transform learning to its anticipated state. The study further emphasized the possibilities of the 21st Century skills through technology. However, educators' beliefs and attitudes remained an obstacle. The educators were found to lack confidence in using technology. Teaching and learning improved when academics began to believe in their abilities. The findings also concluded that there was a significant difference in the TPACK scores of novice teachers compared to experienced teachers in the TPACK domains of technological knowledge, content knowledge, pedagogical knowledge, and pedagogical content knowledge. This meant that novice teachers were found to be comfortable with technologies while experienced teachers showed competency in content knowledge and pedagogical content knowledge. The study showed that both groups could learn from each other. The younger

academics could have easily shared their technological skills with the experienced teachers while the experienced teachers could share their pedagogical content knowledge. The research study by Fontanilla (2016) gave a relevant direction to the study on which this dissertation based.

The TPACK framework continued to thrive in the creation of a knowledge bank about technology integration into teaching and learning spaces. With that in mind, Chai *et al*. (2013:31- 51) reviewed 74 journal papers in ICT's integration from the TPACK framework. The purpose of their study was to further review TPACK research in order to identify the available gap and find ways to close it. It appeared that many educators continued to struggle with the integration of technology for teaching purposes. This was confirmed by numerous researchers worldwide (Shafer, 2008:27-44; Chai *et al*., 2013:31-51). Numerous studies endlessly revealed that educators failed to integrate subject knowledge with technology due to an enormous lack of theoretical fundamentals (Chai *et al*., 2013:31-51). It was undeniable that TPACK had thoroughly captured most concerns of the academics regarding ICT implementation in teaching practices. Therefore, the study conducted at the Institution sought to determine if there were compelling reasons for the perceived resistance by the College academics to technology integration. ICT became an imperative element in creating a conducive environment for teaching and learning with the involvement of the educators. The study was also informed by Jimoyiannis *et al*. (2013:248-267) who investigated the incorporation of Web 2.0 technologies with content and pedagogy regarding instructional-classroom contexts. The framework used was the TPACK framework that focused on technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK) and technological pedagogical content knowledge (TPACK). The aim of the study was to determine the teachers' knowledge of the integration of Web 2.0 tools, pedagogy and content, and how it influenced their professional development.

A number of universities participated in the study to determine the preparedness of educators (Jamieson-Proctor *et al*., 2013: 26-35). The study utilised the TPACK framework developed by Koehler and Mishra (2009:60-70). The findings indicated that educators showed interest in using ICT for teaching purposes. In addition, those educators also demonstrated more confidence in facilitating the students' use of ICT as future educators. On the issue of the

educators' perceptions of the usefulness of ICT for their future students, the findings revealed that the TPACK framework was highly regarded by teachers. TPACK proved effective in evaluating educators' views of technology in teaching and learning. It indicated that about 39 institutions of higher learning in Australia used it to determine the state of their educators. Additionally, the TPACK framework revealed its versatility in various contexts. It is now clear that educators must be knowledgeable about content as well as technology and pedagogy in order to give proper guidance to their millennial age students.

After a review of studies in this section, technology, pedagogy and content integration remained common in all of them. However, the conceptual framework deduced from various studies that the TPACK framework coupled with constructivism is a point of departure due to the nature of technological knowledge dependency. Additionally, the quantitative nature of the study in this dissertation resulted in the researcher amassing comprehensive data from the academics as participants.

2.3.2 Challenges in the Integration of Technology into Pedagogy

According to Nyerere (2012), ODeL became a transitional instrument that closed the gap that existed within the educational space. Educational accessibility became an option for many people who could not previously access education in Africa. Distance education is a cost-effective educational delivery model, which upholds the standards of teaching and learning. In the views of Pityana (2007), ODeL became a viable cost-effective means of providing education to willing people even in places inflicted by scarce resources. Nevertheless, in these developing countries, internet connectivity continued to be a continual challenge to pushing forward the ODeL agenda. The lack of trained professionals to support the course of national distance education implementation continued to be an added disadvantage (Nyerere *et al*., 2012). The study conducted by the National Education Association (NEA) revealed that academics in the United States were concerned about investing more time in technological advancement for the same amount of money. Hence, the need for the current study to establish the capacity of the academics in the College at the Institution regarding technology integration. Academics need to be technologically perceptive to better prepare appropriate study materials for students with or without access to the internet. The findings of the study will assist the Institution to know how to capacitate its academics.

Another study conducted in Zimbabwe indicated that 97.5 percent of the staff complement who facilitated ODeL in the institutions of higher learning lacked experience (Mpofu, Samukange, Kusure, Zinyandu, Denhere, 2012: 207-219). In addition, 84 percent of staff members who dedicated their time to ODeL courses were left with the same workload without any acknowledgement of their efforts. This shows that lack of resources disadvantaged the willing academics from doing what they liked most. Furthermore, the study revealed that 63 percent of the staff members who embraced ODeL did not receive any additional compensation for their commitment towards their initiatives. The current study seeks to ascertain if academics at the College require training to teach their students better. In Botswana, the greatest challenges faced in ODeL was lack of student support (Sikwibele & Mungoo, 2009). In addition, ODeL tutors were few and could not handle the student numbers, which resulted in students feeling neglected (Sikwibele & Mungoo, 2009). The researcher seeks to know if the academics at the College are in the position to give appropriate support to their students.

According to Nyerere *et al*. (2012) most African countries struggled to manage ODeL due to lack of clearly defined national distance education policies unlike South Africa which drafted a distance education policy in 2014 under the auspices of the Council for Higher Education (2014:118). In 2006, Kenya adopted a National ICT Policy to ensure accessibility, efficiency, reliability and affordability for ICT services (Nyerere *et al*., 2012). The policy, among other things, highlighted that the government encouraged the use of ICT in schools, colleges, universities and other educational institutions in the country in order to improve the quality of learning. "The related strategies were to promote the development of e-learning resources; facilitate public-private partnerships to mobilise resources in order to support e-learning initiatives; promote the development of an integrated e-learning curriculum to support ICT in education; and promote distance education and virtual institutions, particularly in higher education and training, among others", said Farrell (2007: 131-145.). Hence, the current study seeks to find ways to align the institutional strategies with the college of science, engineering and technology.

Nyerere *et al*. (2012) conducted a study on 'Delivery of Open, Distance, and E-Learning in Kenya. However, purposive sampling opted to choose two public universities with major components of ODeL, namely the University of Nairobi and Kenyatta University. For both institutions, three regions were selected which represented the urban area (Nairobi), rural area

(Kisimu) and far rural and struggling area (Garissa). The study investigated three different focal points such as ODeL programme delivery across geographical locations, ODeL programme staffing, and ODeL programme resources. In the area of ODeL programme delivery across geographical locations, lecturers were concerned with the consistency across the three regions. The lecturers argued that even though the study materials used in all three regions were the same and delivered by the same lecturers, attention given to the urban region differed completely to that in the rural regions. The findings indicated that lecturers in rural areas were not fully prepared to teach, and students in the urban areas benefitted due to the availability of the infrastructures and connectivity. Students in the urban regions accessed their teaching and learning materials timely and had enough time to prepare for their examinations unlike students in the rural areas. This shows the importance of equipping academics to produce study materials appropriate for teaching and learning. Henceforth, the prerogative for the current study for the Institution to understand the status of its academics with reference to the ODeL 2030 strategic objectives.

On the issue of ODeL programmes staffing, the study revealed that 68 percent of staff complements did not have training on ODeL material and had never been exposed to technological know-how. Most staff members from the University of Kenyatta required ODeL exposure and preparation time for their classes. However, in the University of Nairobi, staff members received enough training and better results were expected of them. The lecturers who participated in the study indicated that they would have done better if ODeL techniques of content delivery had been provided. They complained that they did not have enough time to provide better services to their students. Most of the lecturers complained of being overburdened since they also taught in the residential universities (Nyerere *et al*., 2012). The findings of the current study become relevant in offering the much-needed solution to the academics. On the issue of ODeL resources, the two universities indicated that they depended more on printed materials for delivering purposes. They further indicated that they had challenges in acquiring both hardware and software that were crucial for the ODeL environment (Nyerere *et al*., 2012). The production cost of high-quality materials for ODeL such as the design of curriculum, course authors' fees, remuneration of assessors and reviewers and editing, especially graphics for good presentation were all very expensive. Furthermore, educators were obligated to utilise study materials meant for residential students, which were not designed for students without contact with lecturers (Nyerere *et al*., 2012). Those materials were not adequate to teach students separated from their tutors. In addition,

the institutions lacked current journals and publications on distance learning and could not afford to subscribe to appropriate journals. Those universities experienced low numbers of student enrolments since many people were still exploring the possibilities of ODeL. The current study aims to identify if any assistance is required by the academics regarding resources.

Igbafe Eucharia Chinwe (2016) conducted a study in Nigeria titled 'Problems of Distance Education: implications for Teacher Education in Nigeria'. According to Igbafe (2016, distance education in Nigeria provided opportunities to millions who would not normally have attended school due to their work commitments. Amongst other things, challenges such as globalisation and differing socio-economic lives contributed to individuals opting for various forms of education for them to balance their personal lives and their world of work. It is of vital importance for academics at the Institution to know the profiles of their students to be able to teach them, hence the reason for the study at hand.

The Federal Republic of Nigeria (2004) instituted the National Policy on Education that improved the state of education in Nigeria to produce highly motivated, conscientious and yet efficient classroom teachers on all different levels. The mandate of those teachers was to encourage the spirit of enquiry and creativity in the scholars and to assist them with an intellectual and professional background adequate for their duties. The study took into consideration that the acquired pedagogical skills caused practicing of the teachers' knowledge to become challenging due to tests which took place remotely. The present study has identified the current need the academics might have to create a conducive environment for their students. According Igbafe Eucharia Chinwe, (2016), the listed factors below found concerns hindering progress regarding ODeL:

- Poor electricity connection,
- Literacy and computer skills,
- Lack of libraries in the form of books, audio visual software, audio-visual hardware and other pedagogical material,
- Inappropriate workload,
- Late delivery of study material,
- Low pass rates in assignments and failure to participate in practical sessions,

- Poor societal perception of distance education since it was regarded as a second rate system with no value,
- Students engaged in distance education without prior skills,
- Lack of qualified e-teachers; street delivery of course materials was faced with challenges due to road works and bad weather,
- High dropout rate due to inaccessibility of expensive course material,
- Women following around relocated husbands,
- Lack of qualified e-teachers; street delivery of course materials was faced with challenges due to road works and bad weather,
- Longer distances to learning centres,
- Street delivery of course materials was faced with challenges due to road works and bad weather,
- All infrastructures were poorly equipped with teaching facilities appropriate for distance education,
- Challenges of inequality in the society regarding cost of technological connectivity

Sikwibele and Mungoo (2009) conducted a study looking into distance learning and teacher education in Botswana regarding both opportunities and challenges. The study focussed more on teachers and tutors who had a Diploma in Primary Education by distance mode as well as an in-service programme aimed at upgrading academic and professional qualifications of primary school teachers in Botwsana. According to Sikwibele and Mungoo (2009), distance education was credited with its ability to provide cost-effective teacher education in training large numbers of teachers in a short period of time. Countries such as Nigeria, Tanzania, South Africa, Zimbabwe and Uganda were regarded as providers of successful and large-scale distance teacher education (Siaciwena, 2011). The need for quality education and expansion of the education system in Botswana instigated the demand for qualified teachers. The distance education mode was the solution by the government in order to upgrade primary school teachers from the certificate to the diploma level for them to be skilled in curriculum and instruction reforms (Sikwibele & Mungoo, 2009:1-16). Between 1999 and 2000, 1200 teachers enrolled for the distance education course whereby 1009 reached the final year, while 191 dropped out in 2003. Furthermore, only 522 of the 1009 who wrote the final examinations, passed. They passed because of the attendance of discussion classes during April, August and December. The pressure and demand of the course made some end up dropping out.

According to Sikwibele and Mungoo (2009:1-16), distance learning remained the most preferred way for reaching teachers residing in the remote areas. In addition, its features of being cost-effective and convenient for learners attracted many people who worked full-time. In that case, teachers did not have to deal with full and uncontrolled classes as they taught remotely. In the views of Chute *et al*. (1999), distance learning had other added advantages such as it accommodated more people, learners could learn at the comfort of their own sites, learners were put in the centre of the learning process and they could pace themselves as they wished. It is important for academics to know how to teach in an online environment to guide and support the learners without fail, thus the importance of the present study.

Allegedly, the significant changes in distance education began during the mid-1990s due to the advancement of information and communications technology (ICT) (Arinto, 2013). This transition from the print-based mode of delivery to virtual learning environments and other web-based technologies took the centre stage within teaching and learning (Garrison, 2004). In the views of Ali, Uppal and Gulliver (2018: 156–180), e-learning was about the usage of electronic systems and applications within learning practices. In addition, Wang, Zhu, Chen, and Yan. (2009: 77-81), perceived e-learning as a platform that assisted the remote interaction between students and their educators for teaching and learning purposes. However, different countries experienced it differently. In Asia, there was the highest demand growth rate of 17.3 percent per annum but with high failure rates and high student dropouts in the institutions of higher learning. Similarly, in Pakistan, e-learning was adopted all over the institutions of higher learning but faced all kinds of barriers that limited its long-term success rate (Ali *et al*., 2018: 156–180). In the end, Ali *et al*. (2018: 156–180), proposed a model highlighting about 67 barriers that were hindering e-learning implementations. For the purpose of the current study, institutional barriers were singled out as follows:

- Lack of training and development in faculty and limited change in teaching methodology of faculty in response to ICT developments;
- Lack of effort and support by faculty members being put in use for e-learning;
- Faculty not taking ownership of successful implementation of e-learning technologies and lack of interest in meeting e-learning challenges;
- Faculty putting little effort into giving feedback, making students drop out or fail;
- Course content having less quality in terms of interactivity;
- Faculty facing difficulty in engaging students online;

- Lack of customisation/adaptability of course content according to local culture, language and religious beliefs;
- Lack of student empowerment concerning the decisions related to taking examinations, selection of medium of content delivery etc.;
- Lack of relevance, accuracy of course content and misalignment of course content with future employers' needs;
- Lack of teaching material and courses for teachers in the fields of learning technology;
- Increased communication time principally on e-mail;
- Weak IT skills of faculty members;
- Learning management systems that lack interactivity and have vague features;
- Insufficient support from top-level management;
- Students lacking immediate/prompt responses to their queries from instructors;
- Teachers lacking Technology Acceptance;
- Teachers lacking grip on course content while delivering an e-learning session.

These identified barriers to ODeL successes seem to be common among various authors such as Nyerere *et al*. (2012), Sikwibele *et al*. (2009:1-16). Anderson (2008), mentions that the boundary that existed between course development and course delivery in an online environment was gradually fading away due to the dynamic roles of educators in the design of pedagogy owing to the renewed emphasis on technologies. The present study purposes to discover if issues experienced by academics in the College at the Institution amount to being the same and the study intends to find ways on how to solve them.

2.3.3 Successful Integration of Technology into Pedagogy

According to Dela Pena-Bandalaria (2013:1-6) ODeL has gained momentum since many institutions regarded it an option to advance teaching and learning agendas. Technology became an enabling mode of instruction to enhance learning communities regarding the social construction of knowledge in the distance education fraternity. The learning management system is regarded as the building blocks for teaching and learning. It became the foundation for teaching and learning where course goals and objective emerge. In the case of the Institution, LMS is utilised for both academics and students' interaction for the purpose of teaching and learning.

Dela Pena-Bandalaria (2013:1-6) continued and said that the ODeL environment also required the supporting arm that dealt with learner support services, peer support and administrative support. At the Institution online tutors and face-to-face tutors assisted students to better navigate the learning process. Those support systems were in the form of a cyber coffee shop, e-groups, university community site and even Facebook (Dela Pena-Bandalaria (2013:1-6). Students themselves, with the sole purpose of learning, initiated the establishment of learning communities all over the world. Those students converged and formed community groups for bonding and supporting purposes. It assisted them to have a sense of communal environment instead of being alone and isolated while studying. The other form of learning community was the one initiated by the university itself which differed from that of the students (Dela Pena-Bandalaria (2013:1-6). The university-initiated learning community took the form of learning centres based on geographical settings. Students also used those centres for face-to-face discussion classes and for examination purposes (Dela Pena-Bandalaria, 2013:1-6). According to Dela Pena-Bandalaria (2013:1-6) members of the learning communities constantly communicated online regarding their studies. The common thread that bound them together was the registration list, if they stayed registered. However, challenges emerged when others completed their courses or found other interests and ceased to communicate. The LMS discussion forums assisted students at the Institution to share their frustrations and encourage each other to find learning interesting.

To keep the ODeL community of learning alive, flexibility became essential in order not to disrupt the communication, collaboration and cooperation process of changing community members (Dela Pena-Bandalaria (2013:1-6). Dela Pena-Bandalaria (2013:1-6), mentioned that ODeL learning communities used cultural belief such as Ramadan fasting, the Sabbath and the restriction of women travelling alone to uphold their respect for each other. In some cases, ODeL learning communities were only disrupted and affected when synchronous online discussions via video conferencing, online orientation and online lectures occurred. As a result, educators, online moderators and coordinators were therefore required to devise a mechanism not disadvantaging any student in the process of learning. In this case, community members were compelled to come up with an affordable technology to coordinate teaching and learning continually. It was therefore acknowledged that virtual learning communities provided a platform for both connectivism and constructivism to operate in the learning environment (dela Pena-Bandalaria, 2013:1-6). This confirms the words of Siemens (2017) that connectivism endorsed learning as it supplemented the social construction of knowledge.

In the view of Mishra and Koehler (2006: 1017-1054), online teaching has become a common practice nowadays in higher education. Its added advantage is that it provides flexibility to academics and learners regarding place and time (Mishra & Koehler, 2006: 1017-1054). Additionally, Mishra and Koehler (2006: 1017-1054) mentioned that technological developments and business environment emerged as encouraging factors for employees to upgrade their skills to remain relevant in their workplaces and accommodated those who could not attend fulltime studies in the face-to-face traditional institutions.

2.4 CONCEPTUAL FRAMEWORK

The literature survey indicated how some academics resisted and disregarded technology in their teaching advances. However, other educators understood and welcomed the role that technology played in creating a conducive environment for teaching and learning. For teachers to develop a positive attitude towards technology, they needed exposure within the context of their content matter as well as their pedagogical beliefs (Koehler & Mishra, 2009:60-70). Thus, this study served as a baseline measure of the technological, pedagogical and content knowledge of the the College academics regarding integration within the teaching and learning fraternity. Furthermore, the TPACK scores were found suitable for collecting data from the academics in order to make an informed decision on the way forward for the College ODeL 2030 plan.

The TPACK Framework is a model for technology integration into curriculums (Koehler & Mishra, 2009:60-70). The framework reflects the importance of integrating technology with content and pedagogy as highlighted in figure 2.1. Therefore, table 2.1 gives the description of all seven domains of the TPACK framework as adopted from Chai *et al*. (2013:31- 51) and other researchers. The TPACK framework contains different constructs that cover the infusion of technology knowledge with content knowledge and pedagogy knowledge that assists academics to select the appropriate strategy to present information to the student community. Each construct has a number of questions for data gathering attached to it. From previous studies in the literature review, the researcher deems TPACK scores appropriate to retrieve relevant data from the research participants to determine their knowledge.

2.4.1 Description of TPACK framework

In the view of (Harris, Mishra, & Koehler,2009: 393-416) technology integration plays a pivotal role in education technology but consideration should also be placed on both content and pedagogy. Teachers should consider the role technology plays in teaching and learning for students to understand the content of the subject matter (Maeng, Mulvey, Smetana, & Bell, 2013: 838-857). In fact, technology compliments both content and pedagogy for the teaching and learning process to take place appropriately. According to Mishra and Koehler, (2006: 1017-1054); and Voogt *et al*., (2013), the PCK theory integrated both content and pedagogy to assist teachers to properly teach their students. The TPACK theory acknowledges the interdependences of technological knowledge, content knowledge and pedagogical knowledge in education technology (Mishra *et al*., 2009; Mishra & Koehler, 2006; Voogt *et al*., 2013). Teachers need to master their subject matter and know how to teach and properly integrate technology to better present the lesson to their students (Mishra & Koehler, 2006: 1017-1054; Voogt *et al*., 2013). In the view of Pamuk (2012: 425–439), if the teacher struggles with either content or pedagogy knowledge, effective technology integration might be burdensome. As a result, a teacher is required to deliberate on content, pedagogy and technology as a whole and to understand their connections for successful technology integration (Mishra & Koehler, 2006: 1017-1054).

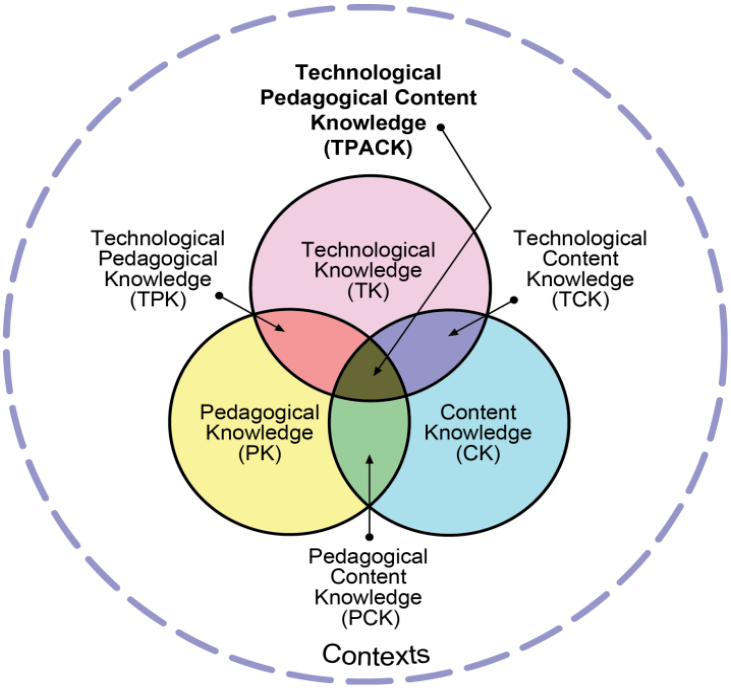

Figure 2.1: The TPACK Framework

Source: Mishra and Koehler (2006: 1017-1054), Koehler and Mishra (2009: 63; 2012)

Table 2.1: Description of the seven domains of knowledge of the TPACK framework

TPACK Constructs	Description	Example
TK	Knowledge about the various technologies a teacher may use (Mishra & Koehler, 2006: 1017-1054); Koehler & Mishra, 2009:60-70)	Knowledge about how to use Web 2.0 tools (e.g., Wiki, Blogs, Facebook)
PK	Knowledge about the theories and methods of teaching (Shulman, 1986:4-14; Koehler & Mishra, 2009:60-70)	Knowledge about how to use problem-based learning (PBL) in teaching and learning
CK	Knowledge about the actual subject matter being taught (Mishra & Koehler (2006: 1017-1054); Koehler & Mishra, 2009:60-70)	Knowledge about Science, Mathematics and other subjects
PCK	Knowledge that blends both the pedagogical and content knowledge, understanding teaching methods that best teach the content (Shulman, 1986:4-14; Koehler & Mishra, 2009:60-70)	Knowledge of using analogies to teach
TPK	Knowledge a teacher needs to integrate technology effectively into curriculum (Koehler & Mishra, 2009)	The notion of WebQuest, KBC, using ICT as cognitive tools, computer supported collaborative learning
TCK	Knowledge that understands the type of technology that is most appropriate to the content taught (Koehler & Mishra, 2009:60-70)	Knowledge about online dictionary, SPSS, subject specific ICT tools e.g. Geometer's Sketchpad, topic specific simulation
TPACK	Knowledge a teacher needs to integrate technology effectively into curriculum. It is where the three types of knowledge intersect representing the connection of all three types of knowledge (Koehler & Mishra, 2009:60-70).	Knowledge about how to use Wiki as a communication tool to enhance collaborative learning in social science

Source: Mishra and Koehler (2006); Chai *et al*. (2013:31-51); Koehler *et al*. (2013).

It is the prerogative of the TPACK framework to expose teachers to technology and its application within the context of the subject matter coupled with the pedagogical undertakings (Harris et al., 2009: 393-416; Mishra & Koehler, 2006). This allows teachers understand the needs of their students coupled with their environment and to provide suitable teaching and learning activities.

2.4.1.1 Detailed description of different domains of knowledge of TPACK framework

The seven domains of knowledge that every teacher needs to take into consideration for successful technology integration include amongst others, TK, PK, CK, TPK, TCK, PCK and TPACK, see figure 2.1 and table 2.1.

Technological Knowledge (TK)

TK signifies teachers' knowledge about both traditional and new technologies that can be integrated into curriculums within education technology (Koehler & Mishra, 2009:60-70). Amongst other things, TK encompasses the ability of a teacher to learn and adapt to new technologies within teaching and learning. In most cases, the rate of technological change becomes radically rapid which requires TK steadfastness (Mishra, Koehler & Kereluik, 2009; Koehler & Mishra, 2009:60-70). In support of this statement, an example is given whereby modern computer hardware and software become quickly obsolete while computers can be utilised for various pedagogical tasks that include research, communication and media consumption.

Content knowledge (CK)

CK denotes any subject-matter knowledge a teacher is responsible for teaching (Koehler and Mishra, 2009:60-70). This knowledge varies depending on the specific discipline such mathematics, biology, engineering science etc. According to Lavadia (2017), CK includes discipline-specific modes of thinking unique to each subject. In most cases, CK differentiates teachers from each other based on their domain of influence.

Pedagogical knowledge (PK)

PK symbolises teaching knowledge regarding different instructional practices, strategies, and methods of promoting students' learning (Shulman, 1986:4-14; Koehler & Mishra, 2009:60-70). Pedagogy signifies the mastery of teaching and impartation of academic knowledge (Lavadia, 2017). PK incorporates the skills every teacher develops in order to manage and organise teaching and learning activities for specific outcomes. It enables every teacher to understand classroom management activities, the role of student motivation, lesson planning, and assessment of learning.

Technological Content Knowledge (TCK)

TCK collates the mutual relationship between technology and content knowledge with education technology (Koehler & Mishra, 2009:60-70). Lavadia (2017) mentions that knowledge within the discipline is guarded by technologies and their representational and functional capabilities. Technology influences what people know and introduces new ways that seemed impossible before. Students who are technologically oriented learn about geometrical shapes and angles from handheld and portable devices. Technology exposes students to content in a fashionable presentation as compared to hearing it from a teacher in a classroom setup. In this digital age, teachers are compelled to go beyond the mastery of their discipline and transform their content by means of technology for their students to understand better (Lavadia, 2017). TCK makes it possible for students to visualise their content due to computer simulations. Therefore, it requires teachers to transit with time to do justice to their students who are digital natives.

Technological Pedagogical Knowledge (TPK)

In this case, TPK recognizes the shared relationship between technology and pedagogy in the coordination of teaching and learning. Technology makes it possible for a teacher to exercise various teaching methods for students to receive information for learning purposes. Lavadia (2017) believes that technology can afford certain pedagogic goals, and for teachers to select the most appropriate tool based on its appropriateness for the specific pedagogical approach. "Technology can also afford new methods and avenues for teaching and ease the way certain classroom activities are implemented. For example, collaborative writing can take place with Google Docs or Google Hangouts instead of face-to-face meetings, extending collaborative activities over distances. Also, the advent of online learning and more recently, massively open online courses (MOOCs) requires teachers to develop new pedagogical approaches that are appropriate for the tools at hand". (Lavadia, 2017). Technologies such as interactive video conferencing makes it possible for synchronous lessons, chatrooms and discussions to take place (Khan, 2011: 215–232.). According to Hofer and Grandgenett (2012), TPK assists teachers to utilise maximally available technologies to support a pedagogical strategy.

Pedagogical Content Knowledge (PCK)

PCK advocates that both pedagogy and content are taught in class (Shulman, 1987:1-22). According to Shulman (1987:1-22), PCK encompasses seven categories such as pedagogy, learner traits, educational contexts, content knowledge, curriculum knowledge, pedagogical

content knowledge, and educational purpose. However, Shulman (1987:1-22) focused more on the knowledge of presenting content and the extent of content learning difficulties within PCK. It is with this belief that teachers' experiences play a pivotal role to better resemble a PCK framework (Shulman, 1986: 4-14; Koehler & Mishra, 2009:60-70). Additionally, teachers who take ownership of PCK can easily transform content knowledge to their students in an understandable manner (Lavadia, 2017). PCK is a complex knowledge that deals with teachers' beliefs and capability to enhance the teaching and learning process by utilising numerous strategies (Lavadia, 2017). Lavadia (2017) further states that it is an individual decision by educators to develop own personal values regarding good teaching, the required standards, and goals for student learning (Lavadia, 2017).

The spirit of collegiality seems to be lacking at institutions of higher learning where educators share teaching practices to enhance learning (Edgerton, 1998). It is important for the educators to share their teaching strategies in order to learn from each other for the benefit of the students. Edgerton (1998:64) further mentioned two principles required for success in the 21st Century institution of higher learning: real understanding and habits of the heart that motivate students to learn. This confirms that every responsible educator should be aware of these elements for teaching and learning to remain effective.

Technological Pedagogical Content Knowledge (TPACK)

TPACK recognizes the interdependencies of technology, pedagogy and content to enable teachers to develop teaching strategies suitable for their students to achieve their specific outcomes (Koehler & Mishra, 2009:60-70). The TPACK framework suggests that it is the responsibility of every teacher to command fundamental understanding of technology, pedagogy and content in order to integrate technology into teaching and learning appropriately. It is important to note that the TPACK framework does not exist in a vacuum but is grounded and situated in specific contexts as seen in the TPACK diagram, in figure 2.1 (Lavadia, 2017). The three fundamental components of TPACK form the basis of the design of the curriculum of the teachers that informs their discipline backed by the utilisation of the digital resources that transform the traditional classroom into a virtual classroom (Koehler *et al*., 2013; Wu, 2013). According to Georgina and Hosford (2009), Hughes (2009), Ng'ambi and Bozalek (2013), technology has become a driving force for teaching and learning as it provides a virtual presence in education technology. Educators at both K-12 and institutions of higher learning

have not yet utilised digital technology to its fullest potential (Fullan & Langworthy, 2014; Voogt, Erstad, Dede, & Mishra, 2013).

Hennessy *et al*. (2005) identified some external influences that affect the successful integration of technology into classroom practices, namely, tensions between the subject content and ICT skills; current regulations regarding examinations, testing, and learning objectives; comparisons with established learning activities; and new forms of subject learning. The success of technology integration of education is dependent upon the teacher commitment. The extent of the success of the transformative potential of technology is linked to the critical attitude of the teachers (Fransson & Holmberg, 2012:193-204). If teachers respond negatively towards technology integration, its success becomes questionable. Hughes (2009) calls teachers who integrate technology into their subject matter integrationists. "The increased presence of laptops in the classroom does not guarantee increased integration of technology into the curriculum because measurable differences depend on contextual features rather than the available technology; the features include changing pedagogical approaches; there is a need for a student-centered environment; and there is a necessity to integrate ICT into the curriculum". Says Lavadia (2017). The way that teachers interpret and transform content determines the extent of inquiry-based learning that technology itself supports (Lavadia, 2017). The TPACK framework affirms that the utilisation of ICT increases student collaboration and changes teaching from a teacher-directed classroom into a student-centred environment (Duran & Fossum, 2010:209-228). Additionally, Hennessy *et al*. 2005, and Hughes (2009) mention that some pedagogical processes of an educator and other decisions coupled with behaviours are dependent on prior knowledge, beliefs and values.

2.5 CONCLUSION

The literature review, amongst other things, elaborated on challenges and successes of ODeL in teaching and learning from both local and global perspectives. Challenges such as women's inability to concentrate on their studies due to their overwhelming home chores, and the working class not finding time to attend daytime classes means they are opting for distance education. Lack of resources, teachers in capabilities and internet in-accessibilities contribute in many institutions struggling to make ODeL environments a success. Technology is currently moving at a faster pace and technology integration in teaching and learning must be equivalent (Ertmer & Ottenbreit-Leftwich & York, C, 2006:55-61). This means that teachers must develop themselves to be able to balance their technological, pedagogical skills along with their subject knowledge for the benefit of their learners.

However, the following factors are deemed important for the successful implementation of any ODeL in any institution:

Learners' motivation in e-learning

Technology has the capability to provide innovative features to make instruction more appealing to learners (Mishra & Koehler 2006: 1017-1054). It was important to note that the more the technology developed the cheaper it became for any needy students to afford it. Mishra and Koehler (2006: 1017-1054) pointed out that many students struggled to access online learning, but the sudden dynamic change made it possible for the learners to afford it, even those living in the far rural areas. As time went by, most students began to afford smartphones with internet accessibility and were able to study wherever they might be in the world. Technology accessibility encouraged students to learn and develop themselves to advance in their careers (Mishra & Koehler, 2006: 1017-1054).

Delivery methods in e-learning

In the study conducted by Tang and Byrne (2007:257-266), it was discovered that the three modalities namely face-to-face, blended and e-learning offered students course content equally irrespective of the mode of delivery. Liao and Lu (2008: 1405-1416), observed that the success of e-learning depended upon the perception of the user about the technology. This meant that if the user had a negative perception towards technology, its success became questionable. Chute *et al*. (1999) mentioned that the fundamentals of developing distance learning systems depended upon the faculty and students, communication services and facilities.

Need for faculty support

Any e-learning platform requires good and well-designed faculty support that creates a constructive learning environment that offers equal opportunities to everyone. It is important that faculties create a conducive environment for people to freely try out their ideal creativity without fear of being judged or looked down upon (King, 2002: 283-297). According to King (2002, 283-297), professional development played a pivotal role in exposing academics to recent technologies for teaching and learning. It was recommended that training becomes a means to keep academics tuned in the current system of teaching and learning. However, their mentalities needed some persuasion in order to see things positively instead of being negative

(Molinillo, Aguilar-Illescas, Anaya-Sánchez, & Vallespín-Arán, 2018:41-52). The involvement of the top management within the teaching and learning operations encourages academics to want to do more.

E-learning success and faculty participation

E-learning can never succeed without the participation of the academic staff since they remain in the centre of teaching and learning because its success is not based on technological ability but on instructional ability (Collis, 1995:136-149). In the view of Webster and Hackley (1997: 1282-1309) the success on e-learning depends upon attitude towards technology, teaching style and control of the technology. Bailey and Card (2009:152-155), asserted in their interviews with the renowned and experienced and yet award-winning e-learning instructors that the following eight pedagogical practices must be considered: fostering relationships, engagement, timeliness, and communication, organisation, technology, flexibility and high expectations. Algahtani (2011) noted that the utilisation of e-learning by any faculty rested more upon their own attitude and confidence, rather than their personal backgrounds or the context of their institution.

Importance of discussion forum

According to Bangert and Arthur (2004), the stimulating factors of the discussion forum depended on the discussion questions which focussed on comprehension, evaluation and opinions because they stimulated thoughtful discussions among students and even promoted deeper levels of understanding. It confirmed that faculties needed to provide more assistance to students than only discussion forums due to its nature of bringing a social presence (Molinillo *et al.,* 2018:41-52). The ever-presence of the academics in the discussion forums make students to want to engage with each other and the academics as well.

E-learning resources and textbook

In the views of Liu, Zhang, and Wang (2015:55-74), the effectiveness of the description and combination of learning resources depended upon the effective organisation of learning content. Mishra and Koehler (2006: 1017-1054) alluded that the e-learning resources such as e-books and other assessments yield enrichment.

The current study rightfully proposed the utilisation of the TPACK framework in order to analyse the working environment at The College. It is important to note that the highlighted

literature review brings out technological issues coverable by the seven elements of the TPACK framework. The belief system and the attitude of educators regarding technology integration with reference to the needs of the students make all the difference. The present study envisages that the adoption of the TPACK framework will alert the state of The College academics regarding technology integration in order to map out a way forward for The Institution's community.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter one provided the research orientation of the current study, since it focusses on the College academics' knowledge on technology, pedagogy and content integration at an ODeL environment. It is of vital importance that every academic teacher in the ODeL environment displays some knowledge of technology integration in order to coordinate teaching and learning activities with ease. The statement of the problem covered in Chapter One rightfully indicated challenges faced by academics who lack technology integration know-how within the current digital age in an institution of higher learning. Subsequently, this section tends to demonstrate the important role that both the research design and methodology in the current study play, as well as to corroborate the choices made in the study. Methodology and research designs give direction to researchers about planning and implementing the desired goal in their study (Kothari, 2004). According to Rajasekar, Philominathan and Chinnathambi (2013), research methodology gives a methodical and coherent approach to solve the research problems which researchers are confronting. Kothari (2004) further confirms that researchers use research methods to provide definition, description, explanation, and eventually prediction of occurrences related to a situation. This chapter covers the research paradigm, research approach, research design, population and sampling, data collection and data analysis employed to address the research objectives and answer the research questions.

3.2 RESEARCH PARADIGM

Paradigms inform the appropriate research methodology to follow with respect to the nature of the study at hand (Jackson, 2016). In the words of Shah and Al-Bargi (2013), paradigms originated with Kuhn in his work on the Structure of the Scientific Revolution where he defined it as an integration of concepts, variables and problems related to corresponding methodological approaches and tools (Hussain, Elyas & Nasseef, 2013) such as the positivist paradigm, interpretive paradigm and critical paradigm. Positivism, interpretivism and the critical approach are viewed as basic research paradigms by researchers (McMillan & Schumacher, 2010:5; Shah & Al-Bargi, 2013; Hussain, Elyas & Nasseef, 2013; Chilisa & Kawulich 2015; Rehman 2016).

Positivism rationalises that only scientific methods can bring knowledge by means of observation through valid empirical evidence (Nieuwenhuis, 2007:55; Cresswell, 2014). Cohen, Manion and Morrison (2007), cited in Shah *et al*. (2013), believe that true knowledge rests upon human sensory experience accomplishable by observation or experiment. Hence, this study prefers the positivism paradigm due to its empirical nature. As a reminder, the study at hand focusses on analysing the knowledge of the College academics based on their integration of technology, pedagogy and content within the ODeL environment.

Positivism takes into considerations its ontological stance with the assumption that the reality exists but is proven through scientific and conventional quantitative methodologies (Shah *et al*., 2013). Various researchers agree that human beings remain preferable and could be studied as a scientific entity in a world that exists independent of human consciousness (Cohen *et al*., 2007; Grix, 2010; Crotty, 2003; Chilisa & Kawulich 2015; Rehman 2016:51-59; Kivunja & Kuyini 2017:26). Positivism allows the academics at the College to demonstrate their knowledge regarding technological, pedagogical and content integration for the researcher to draw a comprehensive and yet informative decision as to the way forward at the College.

The epistemological view of positivists rests on dualist and objectivist positions where both the investigator and the investigated remain independent of each other (Crotty, 2003). It is the case in the current study that the researcher collected data from participants without influencing the data collection process, which means that the participants in the entire process of the study remained independent without compromising the quality of the information gathered.

The ontological and epistemological nature of the positivist paradigm played a paramount role in the disqualification of both the interpretivism and critical paradigm. Interpretivism maintains that truths and multiple realities rest among the points of view of the participants (Thanh & Thanh, 2015:26). On the other hand, the critical theory challenges both positivist and interpretivist paradigms by uncloaking beliefs and practices that shackle human freedom (Scott & Usher, 2011). Additionally, critical paradigm research tries to emancipate people by changing their social, political, and cultural settings and by influencing people to not give a true reflection of their circumstances. Hence, this study opted to discard both interpretivism and critical paradigms and rather embraced positivism. It is important to note that this study

focused on the quantitative approach of the positivism paradigm in order to ascertain the academics' knowledge regarding technology, pedagogy and content integration at the College.

3.3 RESEARCH METHOD

Leedy and Ormrod (2010:12) agree with Babbie and Mouton (2008:74) that research methodology refers to the researcher's general approach in carrying out the research project. Mouton (2001:56) views research methodology as focusing on the research process and the kind of tools and procedures to be used. Methodology is defined as the procedure of conducting the research study from the beginning until the end (Tuli, 2010:102; McMillan & Schumacher, 2010:21; Chilisa & Kawulich 2015; Rehman 2016:51-59; Kivunja & Kuyini 2017). Furthermore, its ability to gather credible information from numerous people earned popularity. Hence, its preference in the study in order to obtain appropriate information from the College academics. The study opted for using the TPACK framework scores due to their characteristics and association with technology integration research. The survey approach allowed respondents to evaluate their own knowledge regarding the different seven TPACK domains such as technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological content knowledge (TCK), pedagogical content knowledge (PCK), pedagogical technological knowledge (PTK) and technological pedagogical content knowledge (TPACK), (see Appendix A - Online Survey Instrument).

3.4 RESEARCH DESIGN

Research design is the science and the art of arranging procedures for conducting studies with the purpose of getting the most valid findings (Collis & Hussey, 2003). Kumar (2011:95) agrees that research design is a detailed plan for conducting research study from the beginning to the end by the operationalising of variables to measure, selection of samples, collection data and analyses of the results. With reference to this study, qualitative research design as an option was inappropriate due to its focus on subjective realities such as attitudes, opinions and behaviour (Kothari, 2004; Cresswell, 2014). According to Alshenqeeti (2014), the qualitative research design allows researchers to extract the sense of human behaviour and beliefs within the contexts at hand. In the view of Anderson (2010), qualitative research gained criticism due to its overuse of interviews and focus groups at the expense of other methods such as observation, case studies and conversational analysis. Similarly, the mixed methods approach was disqualified for its inclusion of qualitative characteristics. Furthermore, the mixed

methods research approach was an integral fibre for collating and collaborating both quantitative and qualitative data by using distinct designs including both philosophical assumptions and theoretical frameworks (Creswell, 2014). However, the current study mainly focused on the academics' knowledge of technological, content and pedagogical integration, which required descriptive analysis. As a result, the quantitative research approach was the only remaining option for this study and it utilised TPACK scores to determine academics' knowledge of technological and pedagogical integration at the College. Therefore, the quantitative research design was deemed appropriate to address the research objectives and answer the research questions due to its non-experimental nature.

Positivist methodology focuses on explaining relationships among various phenomena (Shah *et al*. (2013). The nature of positivists displays the principles of demonstration, verification and causal links between the bits of information used (Chilisa & Kawulich 2015). "Quantitative methods such as experimental (cause and effect) and non-experimental, wherein questions and hypotheses are posited in advance in a propositional way and are subjected to an empirical test (falsification) for verification under conditions that are carefully controlled (manipulated) so that the results are not influenced" (Guba & Lincoln, 1994) as cited in Shah *et al*. (2013). This positivist research exposes the relationships between variables that are consistent in time and context. The TPACK framework was preferred in the current study due to its seven interrelated constructs that demonstrate technology integration knowledge. The study aims to demonstrate how the College academics integrate technology with content and pedagogy to teach more effectively in a distance institution.

In non-experimental approaches, especially in correlational studies like the current study, the researcher refrains from manipulating the independent variable. The researcher cannot generalise the results due to the probability of other justifications gathered as in cause and effect research. The research reports on the analysed results confirmed by quantitative data from experiments, quasi- experiments, standardised tests, scales, questionnaires, closed ended questionnaires, structured interviews and descriptions of phenomena employing standardised observation tools (Pring, 2000:34; Atieno 2009:13-181). It is important to mention that the current study utilised the 5-point Likert scale survey for the participant to display their experiences freely by means of statistically analysed data. According to Atieno (2009:13-181), the quantitative research paradigm is empirical in nature and ensures validity through the process of rigorous clarification. The constructs on the TPACK scores went through testing

for validity and reliably. Therefore, based on the hypothetical justifications above the quantitative research design was found to be appropriate for the current study.

3.5 POPULATION AND SAMPLING

According to Collis and Hussey (2003:56), research population is defined as a set of people or participants forming part of the study. In this case, the population referred to was the College academics involved in teaching and learning. The study was conducted at the Institution in the College of Science, Engineering and Technology, where there were 350 staff members including both academics and administrators. In the view of McMillan and Schumacher (2014: 159–163) samples are participants to collect data from. In the current study, the invitation to participate was sent to all 250 the College academics involved in teaching and learning at the Institution's information communications technology department through the survey link sent to the academics along with the research permission letter by the Research Permission Subcommittee (RPSC) of the Institution's Senate, Research, Innovation, Postgraduate Degrees and Commercialization Committee (SRIPCC) on the 29 March 2019, see Appendix B (Ref#2018_RPSC_049_AR).

Non-probability or convenience sampling was appropriate, because the invited and willing participants in the College took part in the survey. Convenience sampling deals with the availability of selected participants (McMillan & Schumacher, 2014:159-163; Creswell, 2014). The study involved as many participants as possible due to the nature of quantitative research (McMillan & Schumacher, 2014:159-163) in order to get credible results. According to McMillan and Schumacher (2014:159-163), the larger the sample the smaller the expected error.

Hence, the ICT department sent the survey link: (https://forms.office.com/Pages/ShareFormPage.aspx?id=jIuayqM-mUekPlUQOY56Oyq0QQ_JnXlDiFAZ-m7GcARUQTFMS1hHQTkzMDdaWFkwSUk0MVA4WUtKTS4u&sharetoken=9B4gCJXWnVUjj5wldeEQ) to all 250 the College academics, which allowed those who were vailable and with the willingness to participate to complete the survey.

3.6 DATA COLLECTION INSTRUMENT

The purpose of the study was to determine academics' knowledge towards technological, pedagogical and content integration in teaching and learning by using the TPACK framework at The College. The purpose of the survey instrument was to gather data on background and biographical information, knowledge, and behavioural information of the participants (Alise & Teddlie, 2010: 103-126). The study deemed better suited for a survey to collect data about the technological, pedagogical and content knowledge of the College academics. Quantitative data was collected by means of the TPACK scores developed by Koehler and Mishra (2009:60-70). As the study used the descriptive survey, no hypothesis was proposed. The data collection instrument (Appendix A) took the form of an online Microsoft forms survey divided into part 1 and part 2. Part 1 contained biographical information such as gender, age, teaching experience and number of subjects. Part 2 contained the TPACK survey with 38 questions divided into seven domains, which were: technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological content knowledge (TCK), pedagogical content knowledge (PCK) and technological pedagogical content knowledge (TPACK).

Microsoft forms, an online survey tool, was preferred because of its advantages of time saving; cost effectiveness and basic data analysis. The preferred method deemed user friendly since the participants participated at the convenience of their own time and space. The instrument was designed in such a way that the participants needed only twenty-five minutes to undertake the survey. Over the years the TPACK framework has successfully gained credibility for educators to effectively integrate technology especially where technology knowledge, pedagogy knowledge and content knowledge were involved, as developed by Schmidt *et al*. (2009:123–149). The study required the participants to evaluate their knowledge in the seven different TPACK domains, hence the preferences of research population and sampling as mentioned earlier.

The quantitative questions were in the form of a 5-point Likert scale whereby the participants made only one choice. The 5-point Likert scale used following options; Strongly Disagree, Disagree, Neither Agree/Disagree, Strongly Agree and Agree. If the participant was uncertain, he/she could then opt for Neither Agree/Disagree. The instruments utilised in this TPACK survey have been through numerous reliability and

validity tests.

3.5.1 The Data Collection Procedures

The data collection process began by developing the research survey instrument (Appendix A) used to acquire the ethical clearance certificate (Appendix C) from the Institution College of Education research review committee. The research survey instrument, based on the nature of the questions, allows the research committee to evaluate if participants are under any pressure to participate in the study. The acquisition of an ethical clearance certificate from the College of Education research review committee immediately allowed the researcher to obtain research permission from the Research Permission Sub-committee (RPSC) due to the involvement of the Institution's staff members (Appendix B). The researcher then provided the ethical clearance certificate, research permission letter (Appendix D), Online Survey Cover letter (Appendix E) and the participant consent letter for the online survey (Appendix F) to the Institution's ICT department in order to send the link to all the College participants.

All the College participants would receive the information sheet with the link that points to the location of the survey. Upon opening of the link, it immediately opens the survey which begins with the consent form. The participant consent letter (Appendix F) provides the participant with two choices: either agree or disagree to proceed. If the participant agrees to continue, the biographical information appears. However, if the participant opts to not continue by choosing to disagree, the survey automatically closes. Upon completion of the survey questions, the participants would select the 'finish button' that automatically sends the collected data to the researcher's data domain for analysis. Thereafter SPSS was utilised to analyze the collected data by producing various statistical tools.

3.6 DATA ANALYSIS AND INTERPRETATION

The TPACK survey was designed on a 5-point Likert scale, which provided the quantitative data for analysis for each research question. McMillan and Schumacher (2014:159-163) believed that a Likert scale questionnaire was the supreme and most extensively used form of a scaled questionnaire. It was the view of McMillan and Schumacher (2014:159-163) that scaled questionnaires allowed the subjects to place their response on a scale that best reflects their opinions of the statement or question. In addition, Likert scales allowed for flexibility in a subject's response (McMillan & Schumacher, 2014:159-163). The researcher believed that

the choice of that scale allowed the College academics to express their choices freely and without any limitations. The descriptive statistics (mean, range, standard deviation, Cronbach's Alpha, p-value probabilities, correlation matrix) from the TPACK scores were analysed using SPSS (Statistical Package for Social Sciences) version 23. All seven the TPACK scores categories (TK1-6; CK1-4; PK1-6; PCK1-5; TPK1-6; TCK1-8; TPACK1-3) were further segmented into 38 coded statements (Appendix G) taken from the survey instrument (Appendix A) in order to assist with the analysis process. As mentioned earlier, Part 1's data comprised of biographical information of the participants including age, work experience, gender and number of subjects taught. Different charts were used in the interpretation of the information. Part 2, on the other hand, comprised of quantitative statistics such as mean, range, standard deviation, factor analysis, chi-square etc. The analysis of the information from part 1 and 2 was done separately beginning with the biographical data and then the quantitative data. The interpretation of the analysis addressed both sets of the identified questions. The analysis in all collected data seeks to inform the Institution on the direction to take concerning the College's 2030 strategic plan.

3.6.1 Validity and trustworthiness

According to Creswell (2014), validity and reliability of scores on instruments lead to meaningful interpretations of data. The TPACK scores had the added advantage of being utilised countless times in different environments. Therefore, the researcher's interpretations took into consideration the TPACK constructs and the input provided by the College academics. As guided by Kali, Sagy, Kuflik, Mogilevsky and Maayan-Fanar (2015: 5–17) the researcher addressed the need for content and construct validity through previously designed scales and a panel of TPACK experts and readers. Content validity and the adequacy with which the scale was sampled from the intended domain, was derived through previously designed scales (Schmidt, Baran, Thompson, Mishra, Koehler & Shin, 2009:123-149). When dealing with a conceptual framework such as the TPACK scores, construct validity for the elements of the model on all 39 questions was established and referred to all the constructs (Archambault & Crippen, 2009:71-88). In order to use the existing surveys, requests for written permissions were forwarded to Schmidt *et al*. (2009:123–149) and Fontanilla (2016) for use in the current study. Using those previously tested scales as models, the researcher modified the questions to address the need for a TPACK survey that highlighted the population of the College environment. In addition, the survey questions were piloted to ten participants for content validity. This exercise assisted the researcher to gain insight into

whether the survey instrument was user-friendly and allowed the participants to express themselves freely.

3.6.2 Reliability of the TPACK Survey

According to Fontanilla (2016), reliability is defined as the degree to which the scale of the research instrument remains free of random error dependent on the tested group. In addition, Pallant (2011), argued that two commonly used indicators of a scales' reliability are temporal (or test-retest reliability) and internal consistency (Pallant, 2011). The TPACK scores have been tested numerous times for reliability and validity covering all seven domains, by various researchers and doctoral candidates (Schmidt *et al*., 2009:123–149; Fontanilla, 2016). The internal consistencies, through Cronbach Alpha, of those constructs were as follows, according to the TPACK founders (Schmidt *et al*.,2009:123–149): TK – 0.86; Social studies – 0.82, Mathematics –0.83, Science – 0.78, Literacy – 0.83; PK – 0.87; PCK – 0.87; TPK – 0.93, TCK – 0.86 and TPACK – 0.89. Those were the original internal consistencies to show the strengths of these seven constructs. However, it is preferable that they be tested wherever utilised such as in the current study. The researcher therefore tested those constructs again, using Cronbach's alpha value, to make sure they are relevant in the current study, as can be seen in Table 3.1, ranged from 0 to 1.

Table 3.1. Reliability of TPACK Variables

TPACK Categories	Cronbach alpha
TK	0.812
CK	0.811
PK	0.809
PCK	0.813
TPK	0.808
TCK	0.807
TPACK	0.818

According to Fontanilla, (2016); Ali, Uppal, and Gulliver (2018), the Cronbach alpha is made up of inter-item correlations. If the items are strongly correlated with each other, their internal consistency is high, and the alpha coefficient will be close to one. On the other hand, if the items are poorly formulated and do not correlate strongly, the alpha coefficient will be close to zero (Ali, Uppal, & Gulliver, 2018). In the words of Ali, Uppal, and Gulliver (2018), the following Cronbach's alpha coefficients are preferred: 0.90-high reliability, 0.80-moderate reliability and 0.70-low reliability. Therefore, the researcher used the guide of the Cronbach's

alpha in order to determine the internal consistency of the constructs in the questions of the current study, which showed a moderate reliability of above 0.8.

Cresswell (2014) recommended four steps to prepare and encourage participation especially for the mailed survey. The current study opted for an online Microsoft forms survey, as indicated earlier, administered by The Institution ICT department. Therefore, the online Microsoft forms survey was set to send automated reminders to participants who had not yet participated before the given due date. The researcher believed that the selected method made the participants aware of the importance of their participation in the study. The Institution ICT managed to send the survey to the participants as anticipated. However, the data collection took longer than anticipated due to some participants who were reluctant to participate.

3.7 CONCLUSION

The research methodology in this study comprised of a research paradigm, research approach, research design, population and sampling, data collection as well as data analysis. The positivism paradigm was applied due to the quantitative design nature of the study. The nature of the study catered for the survey method for data collection. As such, the convenience-sampling method suited the current study, whereby all academics at the College were invited to participate. Microsoft forms online data collection tool was employed to collect data from The College academics with the assistance of the Institution's ICT department. The Cronbach Alpha was found to be above the moderate of 0.8 for all the seven TPACK categories (TK, PK, CK, TCK, PCK, TPK, TAPCK).

The ICT department was instrumental in sending the survey to all the College academics coupled with automated reminders. The acquired permission letter from the college ethics committee made it possible for the ICT department to send emails with the link to the survey to all the participants. Therefore, the College academics participated willingly in the study since no one was compelled to participate as required by the ethical research committee of the Institution. In order to validate the instrument used for data collection, ten questionnaires were piloted to the College academics. As a result, appropriate changes were adopted accordingly.

CHAPTER FOUR

RESEARCH FINDINGS

4.1 INTRODUCTION

The current quantitative research study sought to investigate how much knowledge was possessed by The College academics concerning the TPACK framework's (Mishra & Koehler, 2006: 1017-1054) integration in teaching and learning. The TPACK framework was utilised to collect data and provide answers to the overarching research question:

What is the baseline knowledge the College *academics possess regarding TPACK integration in teaching and learning?*

And subsequent sub-questions:

- Do academics at the College possess technological knowledge (TK) to create a conducive environment for teaching and learning at an ODeL?
- How much content knowledge (CK) do the College academics have in relation to teaching and learning at an ODeL environment?
- How aware are academics at the College of pedagogical knowledge (PK) in creating a conducive environment for teaching and learning at an ODeL?
- How much knowledge do the College academics command to integrate technological, pedagogical and content knowledge (TAPCK) within teaching and learning (ODeL) institutions?

As mentioned earlier, the data was collected using the online Google forms survey which comprised of demographic data and quantitative data covering all TPACK categories: CK, TK, PK, TPK, PCK, TCK and TPACK. On the quantitative side of the survey, the 5-point Likert scale was utilised for participants to clearly select their preferred choices. It consisted of 1= *Strongly Agree*, 2 = *Agree*, 3 = *Neither Agree nor Disagree*, 4 = *Disagree*, and 5 = *Strongly Disagree*. To make the survey user friendly, the statements were coded based on different categories such as CK1, TK1, PK1, PCK1, TCK1 and TPACK1 etc. It was imperative to indicate that all those categories carried varied numbers of elements. For instance, CK had four statements (CK1-4); TK had six statements (TK1-6); PK had six statements (PK1-6); PCK had five statements (PCK1-5); TPK had six statements (TPK1-6); while TCK had eight statements (TCK1-8) and TPACK had three statements (TPACK 1-3). In total, there were 38

statements conveyed from the survey which covered all seven categories (TK1-6; CK1-4; PK1-6; PCK1-5; TPK1-6; TCK1-8; TPACK1-3), see Appendix G.

The ethical clearance policy at the Institution and the department of education granted participants anonymity if they participated in the survey. Participants participated at their own free will without any pressure from the researcher. Lavadia (2017), Sauemann and Roach (2013) indicated that the normal response rate ranges between 10 to 25 percent. For this study, out of 250 targeted participants only 98 participated. Of the 98 collected data sets, 10 data sets were declared invalid due to uncompleted surveys. As a result, 88 data sets were eventually considered for analysis. The department of information communications technology (ICT) received a mandate to distribute the survey to all 250 the College academic staff members. It remained unknown which of these members participated. However, during the data gleaning process it was discovered that data from 10 people was incomplete and was therefore deleted.

4.2 DEMOGRAPHIC DATA

4.2.1 Gender

Demographic data (figure 4.1) was gathered for all 88 participants. Most participants were male (74%) less were female (26%).

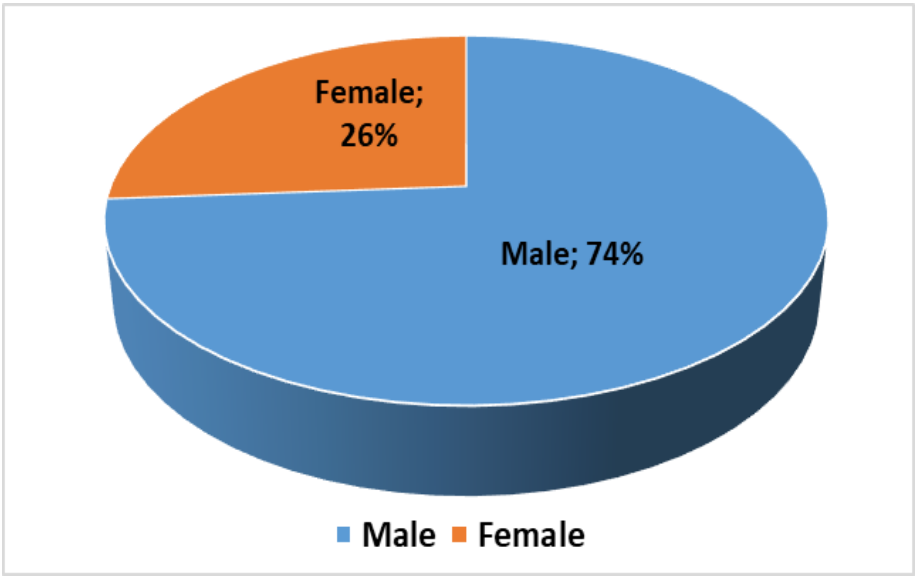

Figure 4.1: Gender

4.2.2 Age

Most respondents (44%) fell in the 45 to 54 years age group, with 32 % in the age range between 35 and 44 years. 9% of respondents were between 25 and 34 years of age, while only 3% were 65 and older (Figure 4.2).

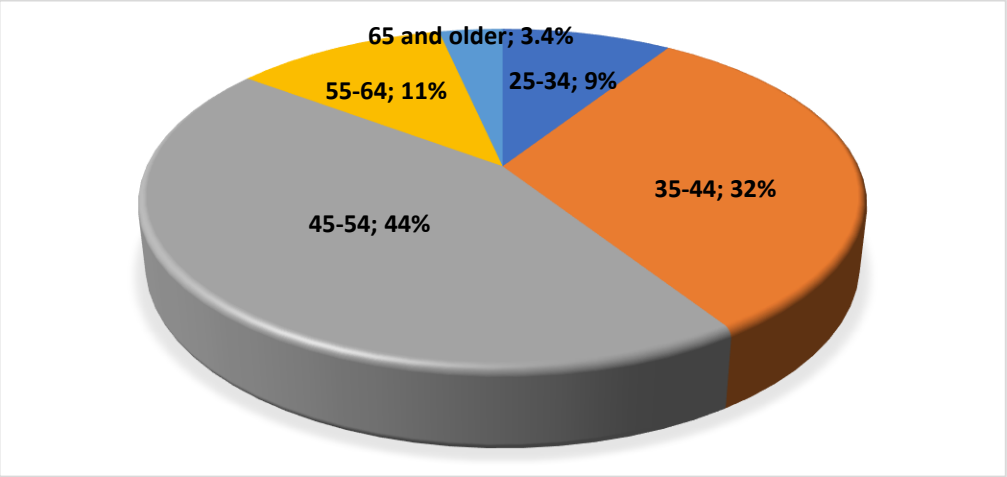

Figure 4.2: Age group

4.2.3 Work Experience

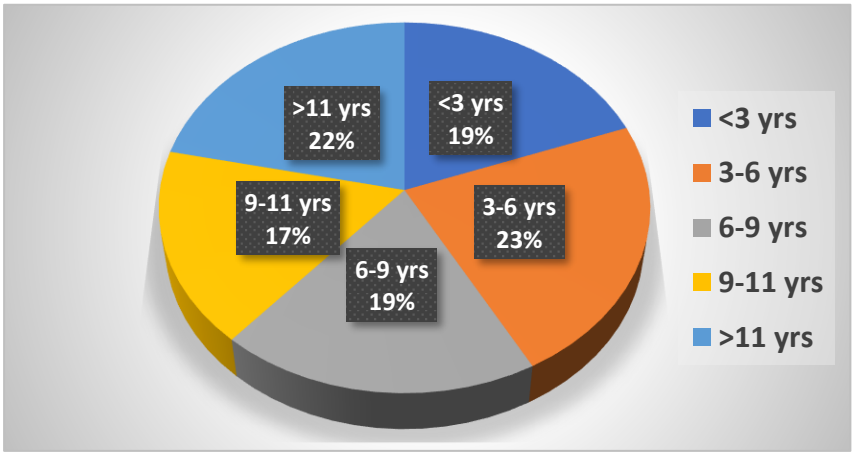

Figure 4.3: Work experience

Figure 4.3 shows the number of years each of the 88 participants had worked at The College. Number of years normally depicts the amount of knowledge obtained. 23% of participants had worked there 3 to 6 years, while 22% of respondents had worked over 11 years, and 19% of respondents had worked there 6 to 9 years. Finally, 17% of respondents had worked there between 9 and 11 years.

Figure 4.4 shows the number of modules taught by all 88 participants; this ranged from one (1) module up until five (5) modules. 43% of respondents taught two (2) modules. The respondents who taught only one module totalled at 17%, while 15% of respondents taught between three (3) and four modules (4). Finally, 8% of the respondents taught five (5) or more modules.

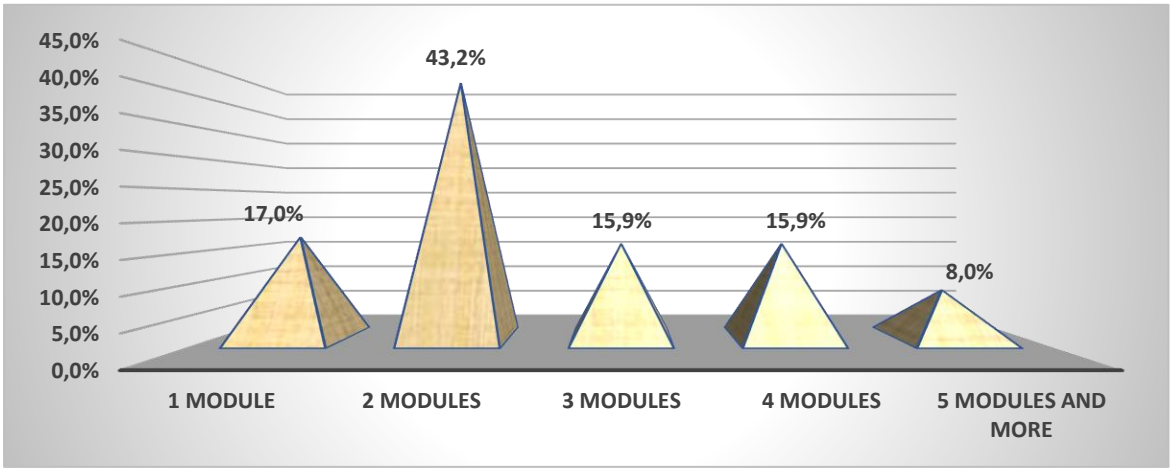

Figure 4.4: Number of modules taught

4.3 DESCRIPTIVE STATISTICAL RESULTS

Table 4.1 below gives an overview of the descriptive statistical results of Minimum, Maximum, Mean, Standard Deviation, and Cronbach Alpha. Based on the results, the Maximum item for gender had two categories (1-2), all others had five categories (1-5). The items of mean and standard deviation show that all the demographic items range from 1.26 to 2.55. This indicates that no statements from the questionnaire were thrown out. As a result, further detailed analysis proceeded with ease. Additionally, Table 4.1 provides an overview of Cronbach Alpha for all the variables from the key categories. It indicates that the Cronbach Alpha value of all the individual variables (TK1-6; CK1-4; PK1-6; PCK1-5; TPK1-6; TCK1-8; TPACK1-3) are well above 0.80. In general, reliabilities less than 0.6 are considered poor, those in the 0.7 range are acceptable, and those over 0.8 are recognised as good. In this case, the internal consistency reliability of the measures used in this study are considered as good when measuring the baseline knowledge, the College academics possessed regarding TPACK integration in the teaching and learning environment.

Table 4.1: Descriptive Statistics (N=88)

	Minimum	Maximum	Mean	Std. Deviation	Cronbach's Alpha
Gender	1	2	1.26	.442	
Age	1	5	2.68	.917	
WorkExp	1	5	2.99	1.434	
Modules	1	5	2.55	1.183	
TK1	1	5	3.01	1.434	.810
TK2	1	5	3.42	1.337	.819
TK3	1	5	2.91	1.551	.812
TK4	1	5	2.70	1.440	.818
TK5	1	5	2.78	1.385	.809
TK6	1	5	2.60	1.419	.807
CK1	1	5	3.47	1.268	.809
CK2	1	5	3.20	1.306	.815
CK3	1	5	2.11	1.418	.811
CK4	1	5	2.00	1.454	.810
PK1	1	5	3.58	1.220	.808
PK2	1	5	2.48	1.330	.811
PK3	1	5	2.45	1.347	.808
PK4	1	5	3.19	1.380	.814
PK5	1	5	3.76	1.339	.813
PK6	1	5	2.97	1.385	.805
PCK1	1	5	3.52	1.330	.821
PCK2	1	5	3.38	1.280	.818
PCK3	1	5	3.92	1.064	.804
PCK4	1	5	3.56	1.133	.801
PCK5	1	5	3.60	1.237	.820
TPK1	1	5	3.66	1.163	.804
TPK2	1	5	2.86	1.374	.815
TPK3	1	5	3.41	1.319	.809
TPK4	1	5	4.03	1.119	.802
TPK5	1	5	3.85	1.099	.805
TPK6	1	5	3.57	1.211	.810
TCK1	1	5	3.50	1.213	.810
TCK2	1	5	4.20	.924	.804
TCK3	1	5	4.26	.965	.802
TCK4	1	5	3.86	1.008	.805
TCK5	1	5	2.66	1.364	.810
TCK6	1	5	3.56	1.312	.821
TCK7	1	5	4.26	.953	.802
TCK8	1	5	4.20	1.041	.804
TPACK1	1	5	3.39	1.208	.820
TPACK2	1	5	3.40	1.352	.826
TPACK3	1	5	3.27	1.293	.807

4.4 TECHNOLOGICAL KNOWLEDGE

Based on the results in figure 4.5, regarding the statements of Technological Knowledge (TK1-6), TK2 obtained high positive responses (48.9% agree) and (18.2% strongly agree).

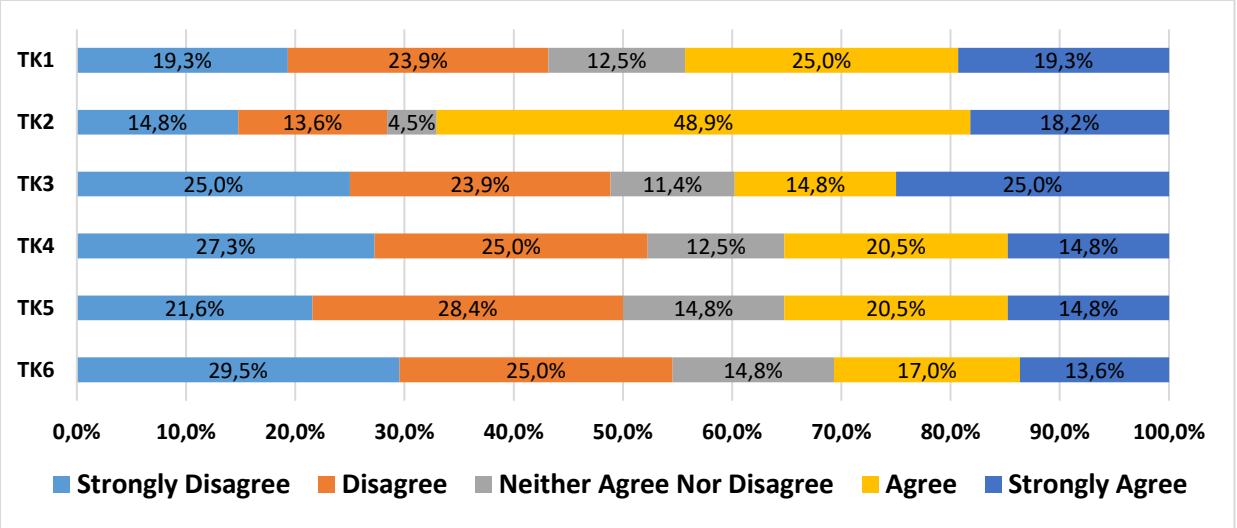

Figure 4.5: Technological Knowledge

TK2 results indicated that 67.1% of respondents usually took time to learn about technology for use within teaching and learning. Besides TK2, other items (TK1, TK3, TK4, TK5 and TK6) totalled less than 50% which reflected that respondents were not in agreement with the statements. For instance, 43.4% of respondents were not in agreement that they depended on other people for assistance to solve technologically related problems in their modules (TK1), while 12.5% neither agreed nor disagreed, and 44% agreed with the statement. Nearly 50% of the respondents were not in agreement with the statement TK3 (I have never used web 2.0 tools (podcasts, vodcasts, social networks, and blogs) for teaching and learning), where 11.4% neither agreed nor disagreed and 40% agreed with the statement. Similarly, TK4, TK5 and TK6 items indicated that more than 50% of the respondents and were not in agreement with the statements. i.e. 52.3% said they do not have time to use the LMS tools related to training (TK4); 50% rarely play around with the technology tools for teaching and learning (TK5); and 55% said their technological skills were limited regarding teaching and learning (TK6).

4.5 CONTENT KNOWLEDGE

On the content knowledge statements (CK1-4) in figure 4.6, CK1 obtained positive responses (31.8% agreed and 23,9% strongly agreed), 56% of the respondents agreed with the statement (I prefer to give answers to students' questions after more research regarding the module I

teach), 23% of participants disagreed with the statement and 22% remained neutral to the statement.

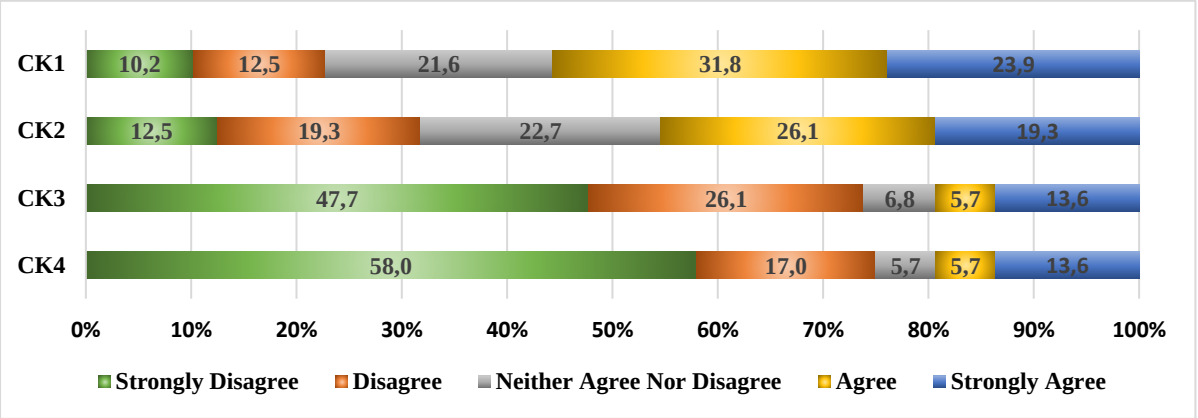

Figure 4.6: Content Knowledge

Approximately 45% of respondents agreed with the statement CK2 (I choose to stick to my own ways and strategies of developing understanding of the subject I teach), where 32% of the respondents disagreed with the statement CK2 and 23% remained neutral. Both CK3 and CK4 categories reflected that more than 70% of the respondents disagreed with the statements. For instance, 74% did not agree that they struggled to make connections between the different topics in the content of the subject they taught (CK3), while 75% of the respondents disagreed with the statement CK4 (I rather skip chapters that I do not understand in my module than make a fool of myself in front of students). Both CK3 and CK4 statements indicated that less than 20% of the respondents agreed with the statements.

4.6 PEDAGOGICAL KNOWLEDGE

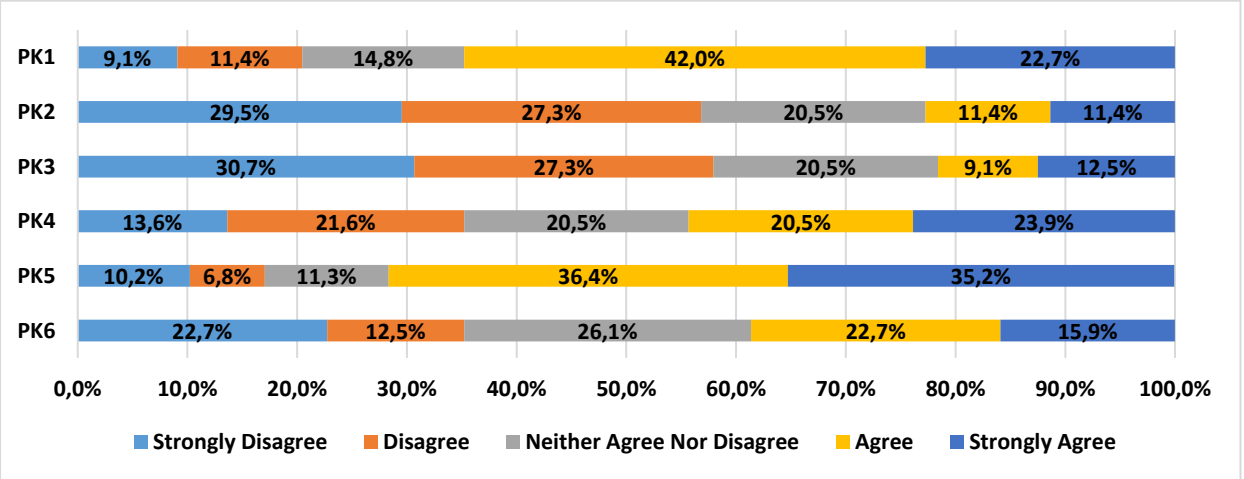

Figure 4.7: Pedagogical Knowledge

Figure 4.7, on the statements of Pedagogical Knowledge (PK1-6), PK1 and PK5 obtained positive responses which totalled more than 50%. 71% (36% agree and 35% strongly agree) of the respondents agreed that they adapted their teaching based upon what students understood (PK1), while 65% (42% agree) and (22.7% strongly agree) of the respondents agreed that they addressed common student misunderstandings about the subject they taught (PK5). At the other items (PK2, PK3, PK4 and PK6), less than 50% of the respondents agreed with the statements. For instance, 44% of the respondents agreed that they marvel at other lecturers' curriculum development as they easily match content with teaching strategies PCK4, and 38% of the respondents agreed that they found it difficult to use a wide range of teaching approaches for their students (PCK 6). In addition, 23% of the respondents agreed with the statements saying they found it challenging to align learning activities with teaching methods (PK2) and 22% of the respondents agreed that they found it difficult to adapt their teaching styles to different learners (PK3).

4.7 PEDAGOGICAL CONTENT KNOWLEDGE

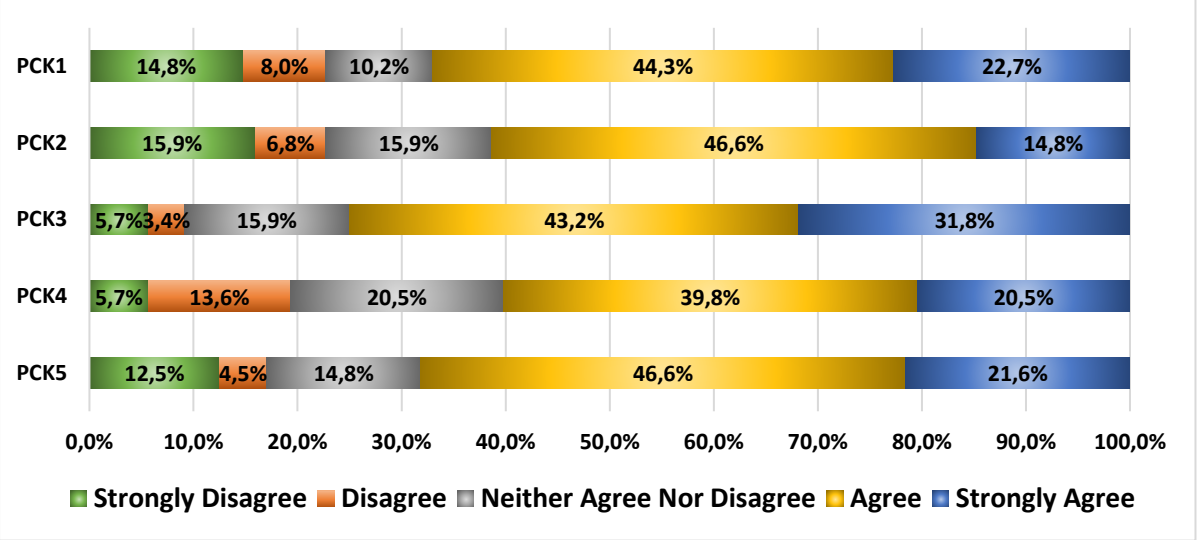

Figure 4.8: Pedagogical Content Knowledge

Figure 4.8: With Pedagogical Knowledge (PCK1-5), all items (PCK1, PCK2, PCK3, PCK4 and PCK5) totalled more than 60% and respondents positively agreed. For instance, 63% of respondents agreed that they used several methods to provide multiple presentations of content, e.g. analogies, demonstrations, and activities (PCK1), nearly 61% agreed that they used various strategies to adapt content to their understanding in their subject area (PCK2), about 75% of respondents agreed to the PCK3 statement (There is a relationship between the content

and the teaching methods I use for the students), almost 60% of the respondents agreed with the statement PCK4 (I need additional methods to adapt material to students' prior knowledge) and about 68% of respondents that they selected effective teaching approaches that guided student thinking and learning in different subjects they taught (PCK5). On the contrary, the respondents who disagreed were between 9% and 23%. While those who remained neutral were between 10 and 21%.

4.8 TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (TPK1-6)

Figure 4.9 indicates that the statements of Technological Pedagogical Knowledge (TPK1-6), (TPK1, TK3, TPK4, TPK5 and TPK6) totalled more than 50% which reflected that respondents agreed with the statements. For instance, 65% of respondents agreed that they showed their leadership skills by helping others to coordinate the use of content, technologies, and teaching approaches (TPK1).

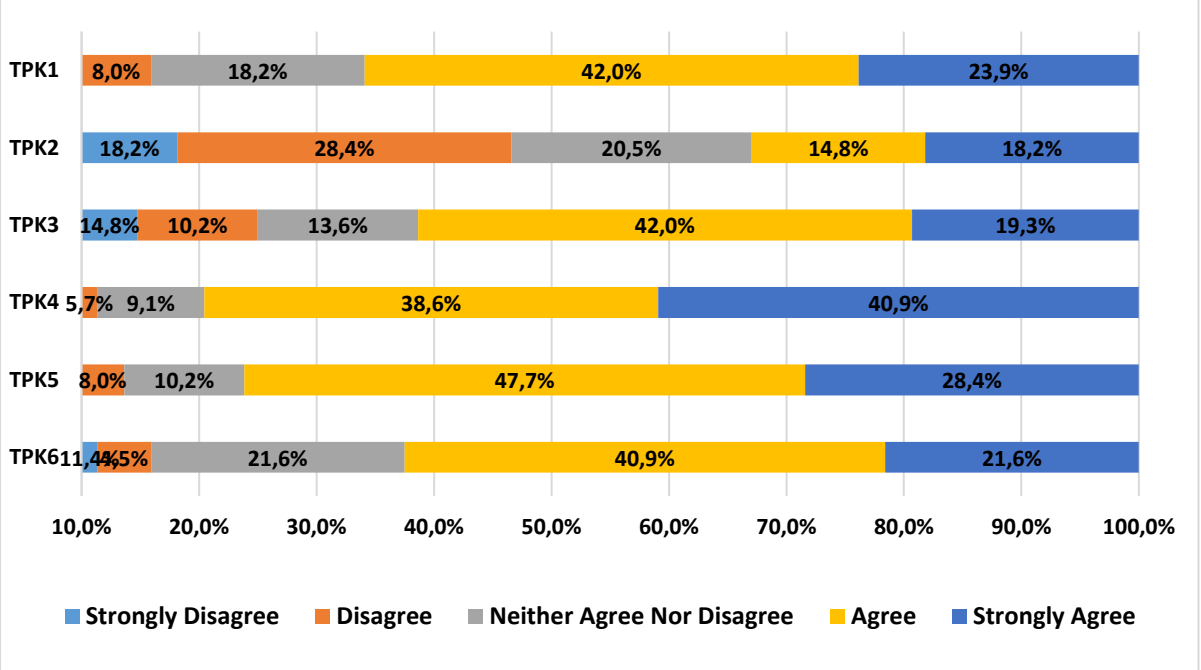

Figure 4.9: Technological Pedagogical Knowledge

About 61% of respondents agreed that they always adapted certain technologies to improve their content delivery (TPK3). Nearly 80% of the respondents agreed that they believed that by using technology, their instruction (mode of content delivery) would be more interesting to students (TPK4). Approximately 76% of the respondents agreed that they thought critically on how to use technology effectively in their content delivery (TPK5). Around 65% of the respondents agreed that they selected technologies to use to their students to enhance what

they taught (TPK6). On the other hand, 47% of the respondents disagreed that they requested someone to modify technologies to support student learning (TPK2), while 33% of the respondents agreed to the statements and 20% of the respondents chose to remain neutral.

4.9 TECHNOLOGICAL CONTENT KNOWLEDGE

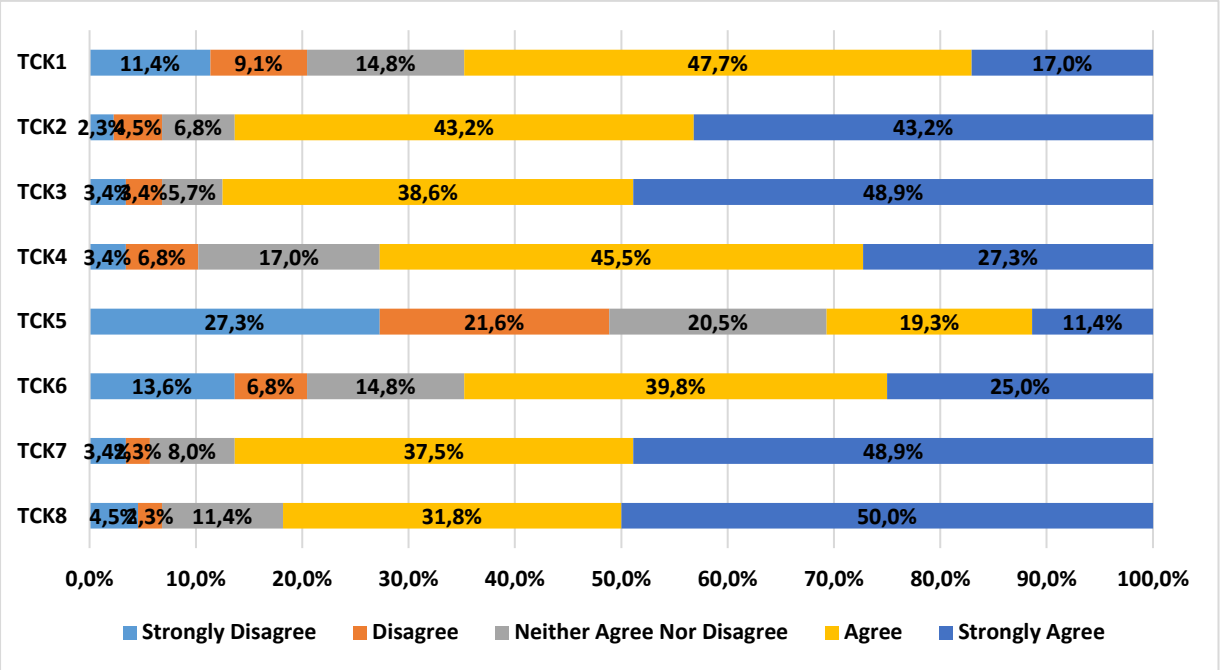

Figure 4.10: Technological Content Knowledge

Figure 4.10, the statements of Technological Content Knowledge (TCK1-8), items such as TCK1, TCK2, TCK3, TCK4 and TCK6 totalled more than 50% which reflected that respondents agreed with the statement. For instance, 65% opted for technologies that enhanced the content for a specific lesson (TCK1); 86% believed that properly designed learning activities with technology promoted students' critical thinking (TCK2); 88% agreed that properly designed learning activities with technology enhanced students' creativity (TCK3); 73% agreed to know about different technologies that provided different representations of the same content (TCK4); 65% of the respondents agreed with the statements TCK6 (I can effectively integrate the appropriate technology into the content of the subject I am teaching); 87% agreed with the statement TCK7 (I believe that properly designed learning activities with technology can also enhance students' creativity) and 86% agreed that properly designed learning activities with technology promoted students' active participation. On the contrary, nearly 49% of the respondents disagreed with the statements TCK5 (My curriculum content knowledge limits the kind of technology that can be integrated into the learning environment).

4.10 TECHNOLOGICAL PEDAGOLOGICAL AND CONTENT KNOWLEDGE

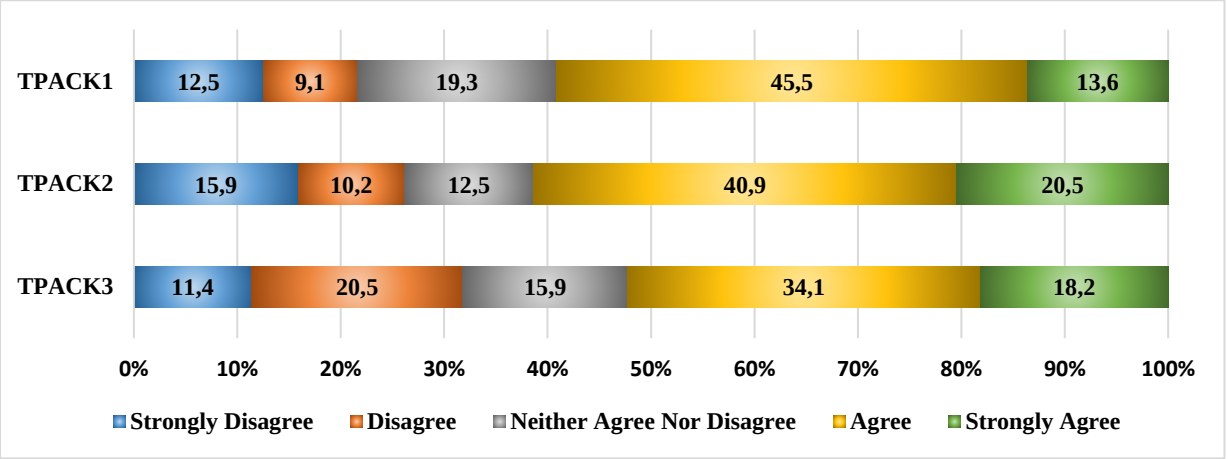

Figure 11: Technological Pedagogical and Content Knowledge

Figure 11 shows the Technological Pedagogical and Content Knowledge (TPACK) statements (TPACK1-3), where all categories TPACK1, TPACK2 and TPACK3 indicated that more than 50% of the respondents agreed with the statements. For instance, 59% agreed with the statement TPACK1 (I teach lessons that appropriately combined technology and teaching approaches); 61% agreed with the statement TPACK2 (I believe that I was not well prepared to manage the educational changes that technology brought in teaching) and last but not least 52% of the respondents agreed to the statements TPACK3 (Integrating educational technologies into student learning was a challenge).

Table 4.2 showed the test statistics of age and gender. The probability values (p) of PK2, PCK3, PCK4, TPK1, TPK5, TPK6, and TCK4 were less than 0.05, which indicated that there was a significant difference between these variables and age groups. In addition, the table also showed that the p value of TK4 at 0.003, which is less than 0.05 and indicates that there is a significant difference between TK4 and gender groups.

Table 4. 2: Test Statistics of age and gender

	Age				Gender			
Items	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
TK1	508,500	914,500	-0,489	0,625	674,500	950,500	-0,710	0,478
TK2	470,000	876,000	-1,026	0,305	660,000	936,000	-0,890	0,373
TK3	470,000	1250,000	-0,992	0,321	717,500	993,500	-0,292	0,770
TK4	514,500	1294,500	-0,410	0,682	444,500	720,500	-2,952	0,003
TK5	496,000	1276,000	-0,649	0,516	682,500	958,500	-0,633	0,527
TK6	534,500	1314,500	-0,150	0,881	587,500	863,500	-1,561	0,119
CK1	434,000	1214,000	-1,472	0,141	733,500	1009,500	-0,137	0,891
CK2	424,500	1204,500	-1,583	0,113	684,000	960,000	-0,617	0,537
CK3	528,500	1308,500	-0,235	0,814	655,500	931,500	-0,936	0,349
CK4	527,500	1307,500	-0,257	0,797	620,000	896,000	-1,356	0,175
PK1	462,000	868,000	-1,107	0,268	741,000	1017,000	-0,065	0,948
PK2	376,500	782,500	-2,213	0,027	640,500	916,500	-1,047	0,295
PK3	407,000	813,000	-1,812	0,070	674,500	950,500	-0,715	0,475
PK4	450,000	856,000	-1,249	0,212	643,500	919,500	-1,010	0,313
PK5	527,500	933,500	-0,247	0,805	592,500	2737,500	-1,551	0,121
PK6	439,000	845,000	-1,393	0,164	574,000	850,000	-1,688	0,091
PCK1	534,000	940,000	-0,160	0,873	546,000	2691,000	-2,021	0,043
PCK2	502,500	908,500	-0,584	0,559	621,000	2766,000	-1,275	0,202
PCK3	387,000	793,000	-2,134	0,033	581,500	857,500	-1,678	0,093
PCK4	393,000	799,000	-2,026	0,043	700,500	976,500	-0,466	0,641
PCK5	495,500	1275,500	-0,669	0,503	737,500	2882,500	-0,101	0,920
TPK1	346,500	752,500	-2,642	0,008	579,500	855,500	-1,677	0,094
TPK2	456,500	1236,500	-1,164	0,244	564,000	840,000	-1,785	0,074
TPK3	399,000	805,000	-1,938	0,053	717,500	2862,500	-0,298	0,765
TPK4	449,500	855,500	-1,306	0,191	746,500	1022,500	-0,010	0,992
TPK5	393,500	799,500	-2,061	0,039	694,000	970,000	-0,546	0,585
TPK6	397,000	803,000	-1,968	0,049	726,500	2871,500	-0,209	0,834
TCK1	405,000	811,000	-1,882	0,060	738,500	1014,500	-0,091	0,927
TCK2	491,000	897,000	-0,758	0,449	735,500	1011,500	-0,124	0,901
TCK3	526,500	1306,500	-0,273	0,785	723,000	2868,000	-0,256	0,798
TCK4	339,000	745,000	-2,781	0,005	575,000	851,000	-1,746	0,081

	Age				Gender			
Items	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
TCK5	437,000	843,000	-1,419	0,156	617,000	893,000	-1,270	0,204
TCK6	530,500	1310,500	-0,205	0,838	684,000	2829,000	-0,630	0,529
TCK7	518,000	924,000	-0,391	0,696	742,000	1018,000	-0,057	0,954
TCK8	543,000	1323,000	-0,041	0,967	731,500	2876,500	-0,166	0,868
TPCK1	505,500	1285,500	-0,537	0,592	683,500	2828,500	-0,643	0,520
TPCK2	507,000	1287,000	-0,515	0,607	664,500	2809,500	-0,824	0,410
TPCK3	528,500	1308,500	-0,229	0,819	692,500	2837,500	-0,539	0,590

4.11 CONCLUSSIONS

The results section is comprised of both demographical data and quantitative data, where the demographical data alluded to the working experience, number of modules taught, age difference as well as gender. The information above gives a clear indication of the calibre of The College's academic staff regarding their working experience as well as number of modules taught.

The descriptive statistics, mean, standard deviation and Cronbach's Alpha were discussed according to Table 4.1. The reliabilities of the Cronbach's Alpha value (TK1-6; CK1-4; PK1-6; PCK1-5; TPK1-6; TCK1-8; TPACK1-3) were found to be reliable and good as they ranged from 0.807 to 0,821.

The probability values (p) of PK2, PCK3, PCK4, TPK1, TPK5, TPK6, and TCK4 were less than 0.05, which indicated the significant difference between the age groups and gender as seen in Table 4.2.

CHAPTER FIVE

RESEARCH FINDINGS DISCUSSION

5.1 INTRODUCTION

The research study sought to ascertain the College academics' knowledge about technology integration in teaching and learning. The TPACK framework was utilised to appropriately draw a conclusion in this matter and to better advise the college's management on how to capacitate the academics in order to provide decent service to the student community. The study aimed to answer the question about the baseline knowledge the College academics possessed regarding TPACK integration in teaching and learning supported by the sub-questions highlighted below:

1. *Do academics at* the College *possess technological knowledge (TK) to create a conducive environment for teaching and learning at an ODeL environment?*
2. *How much content knowledge (CK) do* the College *academics have in relation to teaching and learning at an ODeL environment?*
3. *How aware are academics at* the College *of pedagogical knowledge (PK) in creating a conducive environment for teaching and learning at an ODeL institution?*
4. *How much knowledge do* the College *academics command to integrate technological, pedagogical and content knowledge (TAPCK) within teaching and learning at an ODeL institution?*

The findings of the study are comprised of both demographic data and descriptive statistics of all the seven categories. The results confirmed men as the majority representation as compared to women who were gradually increasing. The initiative like 'Women in engineering' propelled women to begin joining the ranks of academics in the college. It is imperative to point out that the study did not bring in the issue of gender to draw a comparison on who integrated technology better between women and men, but as an issue of interest. As in studies conducted by other researchers, demographic factors like gender and age have no significant influence on the instructors' online teaching competencies (Wang, Wang, Stein, Liu, & Chen, 2019:363-384). A similar conclusion was drawn in the current study because the study focussed more on the TPACK integration with regards to teaching and learning. However, it is imperative to mention that numerous College academics underwent professional development programmes such as 'Young academics' and the Institution/University of

Maryland University College (UMUC) partnership. With the Young academic's programme, newly appointed staff members in college are provided with an opportunity to understand the Institution's internal operational processes about teaching and learning as well as research activities. On the other hand, The Institution/UMUC partnership offered academics an opportunity to learn more about teaching in an online environment. Other researchers share the same sentiments that educational levels, online teaching experience, and online learning experience had significant effects on instructors' competencies in selecting appropriate tools, preparing learners to learn online, and facilitating online learning (Wang *et al.,* 2019; Sogillo, Guimba & Alico, 2016: 7-16). It is evident that academics who are competent technologically are those with formal qualifications and those who have attended technologically related training.

The section below covers the findings' discussions based on the research questions above that the study seeks to solve.

Research sub-question 1: Do academics at the College **possess technological knowledge (TK) to create a conducive environment for teaching and learning at an ODeL institution?**

It is the view of McLoughlin and Alam (2019:4), that skills necessary for digital age success include, among others, digital literacy skills and creativity, thus not just knowledge acquisition. They further alluded that expertise with information technology enables new abilities and ways to participate and express ideas in the current digital world as well as the networked society (McLoughlin & Alam, 2019:4). The purpose of the question above allowed the participants to demonstrate how knowledgeable they were regarding technology integration at the institution of higher learning, the College academics. In order to properly ascertain their knowledge on technology integration, about six questions converted from various TK characteristics were asked. As indicated in figure 4.5, six questions were asked regarding TK1-6; and on technology knowledge (TK2) 67% of the respondents indicated that they normally took time to learn more about technology for teaching and learning. It gave a positive impression that most of the College academics allowed themselves time to understand different technologies for teaching and learning purposes, such as video lessons, virtual classes, WhatsApp groups etc.

TK2 responses indicated that most academics at the Institution attended the LMS tools as a

training initiative on how to effectively use the Institution LMS. The participants showed positive impressions towards technology tools in teaching and learning. However, the other five elements of TK (TK1, TK3, TK4, TK5 and TK6) gave an impression that the College academics lacked interest in technological tools for teaching and learning. In general terms, most of the participants showed to be anti-technology and this can be translated that they lacked technological know-how. It remained a disadvantage to students when they are taught by academics who are not technologically oriented. In general, the results from the answers to the above questions revealed less interest of academics towards technology integration (Swart, 2015:237-242). Additionally, another researcher discovered that academics lacked skills regarding technology web 2.0 tools, for teaching and learning (podcasts, vodcasts, social networks, and blogs).

In the study conducted by Swart (2015:237-242), the pass rate for students who used social media groups was 100% compared to 60% of learners not using social media groups. It could be concluded that academics who used technology as a platform for teaching and learning gave their students an upper hand. The results of the study further indicated that social media had the potential to greatly increase student engagement for both the course content, academics, assessments and fellow students, leading to greater academic success (Swart, 2015:237-242). Academics should therefore put the interests of their learners ahead of themselves regarding developing themselves technologically. Those academics who lacked technology interest should also adapt with time, to accommodate the digital age of the 21st century. It is of vital importance that academics become confident and competent with technological tools for meaningful engagements within teaching and learning environments (Kop, 2011: 19-38).

In another study conducted by Lenkaitis (2019:1-27), technological tools were effectively utilised to coordinate teaching and learning at a university where students interacted and connected beyond classroom walls. By means of zoom videoconferencing, students managed to communicate interpersonally with their instructors (Lenkaitis, 2019:1-27). It is important to note that the interest of an instructor in technology, makes it possible for students to connect easily. Therefore, it is imperative for instructors to have knowledge of the technology at hand to coordinate learning properly (Thorne, Sauro, & Smith, 2015: 215-233). It is of paramount importance for instructors to factor in their own technological skills when planning learning and training activities for students (McLoughlin, & Alam, 2019. Teachers need to not only plan for learning activities, but also consider technical support and training for students when

introducing social media and they must also test all the technology thoroughly before using it in a class.

It also appears that most of the College academics come from traditional face-to-face institutions while others come straight from industry without any teaching background especially in an online environment and they therefore lacked competencies in selecting appropriate teaching tools (Wang *et al.,* 2019: 363-384). Additionally, it appears that more training for the instructors to be able to use technological tools remains of vital importance (Wang *et al.,* 2019: 363-384) as in the case of the College academics. It is imperative to also state that the College puts emphasis on training academics on technological skills as in the case of the Chinese teachers' professional development (Liu, Zhang, & Wang, 2015: 55-74). Imparting technological knowledge to academics is as important as guiding them to know how to design and organise online teaching activities (González-Sanmamed, Muñoz-Carril, & Sangrà, 2014: 162-187). Researchers continuously put emphasis on and confirm that any increased student learning in higher education is as a result of higher-quality teaching from the professional and well-developed instructor (Gess-Newsome, Taylor, Carlson, Gardner, Wilson, & Stuhlsatz, 2019: 944-963). This statement confirms that academics who adheres to professional developmental activities normally stand a strong chance of giving better service to students.

Research sub-question 2: How much content knowledge (CK) do the College **academics have in relation to teaching and learning at an ODeL environment?**

"To qualify as a high-quality instructional episode, a teacher must justify the importance and structure of the content they are teaching, their selection of pedagogical techniques, and how this combination effectively attends to the teaching context as it relates to meeting student-learning needs (background knowledge, preconceptions, and common areas of conceptual difficulty)", says Gess-Newsome *et al*. (2019:944-963). The quotation above resembles the nature of content knowledge (CK) that academics at the College need to possess in order to teach effectively. The current study depicted four categories,namely CK1, CK2, CK3 and CK4, whereby the participants responded positively in three categories (CK1, CK3 and CK 4). CK1 (56%) (I prefer to give answers to students' questions after more research regarding the module I teach). This statement indicated that the participants always did a thorough research to confirm with other researchers based on their content knowledge.

Both CK3 (20%) (I struggle to make connections between the different topics in the content of the subject I teach) and CK4 (20%) (I rather skip chapters that I do not understand in my module than to make a fool of myself to students) appear to have answered negatively. However, in the true sense of it, the responses were positive based on the questions asked, as this shows that most responders understand the importance of knowing the content of their modules. The results regarding academics' content knowledge are consistent with the results of other researchers (Gess-Newsome *et al.,* 2019: 944 – 963) which show the importance of personal development initiatives that provide them with new instructional materials and practices that support teaching and learning. According to Lavidia (2016), other institutions lack professional development initiatives for their academics regarding technology integration in teaching and learning. This confirms that it must become the prerogative of the institutions to make resources available to support academics regarding module content mastery. Hughes (2005), as cited in Lavadia (2016), indicated some challenges with professional development that assists with reflective and subject matter-based technology use within the institutions of higher learning. It is not enough for academics to take charge of content knowledge without having the appropriate means of teaching the students (Günther, Fleige, zu Belzen, & Krüger, 2019:321-343).

Other researchers used the example of saying that any functional mathematics teaching depends on the instructor's subject matter knowledge (Posey, Bieda, Mosley, Fessler, & Kuechle, 2019: 135-155). This signifies the importance of mastering content knowledge for any affective teaching and learning to take place. In general terms, the understanding of content by academics plays a pivotal role in the lives of students regarding whether good or bad knowledge is transferred to students. In normal cases, the academics with good understanding of content develop various strategies of teaching to make sure that students learn as much as they can. While on the other hand, if academics lack depth in content, they also lack confidence while sharing their knowledge with students, and answer students' questions with uncertainty and sometimes students pick this up. In a distance environment, students frequently do not get their feedback on time especially when questions have been asked. It is even sometimes difficult for the academics to call a student in order to give a satisfactory answer.

It is the responsibility of academics to empower themselves regarding module content knowledge in order to know enough to teach and guide students appropriately. The findings

in the study conducted by Berry (2019:121-136) confirm that the guided practice session within the virtual classroom increased the technical knowledge of the newer instructors. Frequent biweekly meetings also assisted them to build content knowledge as well as online pedagogy. Other added benefits from professional development programmes included asynchronous materials, webinars, synchronous lessons, practice sessions in the virtual classroom, 24-hour technical support phone line sessions, in-class technical support and weekly faculty meetings (Berry, 2019:121-136). Teachers need a profound understanding of this content as well as knowledge on how to teach the students in their field. It is of vital importance to note that the College encourages academics to register for an online distance education qualification offered in partnership with the Institution and the University of Maryland University College. Unfortunately, few of the academics heeded the call while others are still reluctant. The results regarding content knowledge can be justified by the fact that some academics who are taking interest in developing themselves may be among those registered for the ODL qualification.

Research sub-question 3: How aware are academics at the College **of pedagogical knowledge (PK) in creating a conducive environment for teaching and learning at an ODeL?**

The results on the pedagogical knowledge categories (PK1-6), indicated that only two categories (PK1 & PK5) received direct positive responses whereby academics adapted their teaching based upon what students understood and further addressed common student misunderstandings about the subject they taught. The PK1 (71%) category (the respondents agreed that they adapted their teaching based upon what students understood), gave the impression that the College academics tried various teaching strategies until they found one which their students understood. Teachers have the responsibility to promote positive attitudes towards learning and student engagement (Barkley & Major, 2020). As such, academics with teaching strategies carry the potential to make students interested in the content presented to them. It takes time and dedication for an academics to search for different teaching approaches that suit the students registered for their modules each time. The willingness of instructors to employ various strategies to teach makes all the difference for teaching and learning to take place with ease (Zhou & Wei, 2018:471-495). It is not always a matter of using one strategy and hoping that it works every time. It is also important for academics to always review their previous examination statistics in order to assess their teaching strategies and bring

improvement. In engaging with other academics in an institution of higher learning, the researcher discovered that some colleagues did not see the importance of evaluating their modules.

The PK5 (65%) category (where the respondents agreed that they addressed common student misunderstandings about the subject they taught), also depended upon the College academics' ability to understand their students by gathering information based on challenging areas in the respective modules. After doing this, they then collated solutions to address these identified misunderstandings. Yet again, the dedication and character from those academics were proven to be beyond measure. According to literature, such teaching qualities would usually be displayed by academics with educational qualifications, hence the importance of staff development (Evens, Tielemans, Elen, & Depaepe, 2019: 422-439). It is sad to mention that most academics at the College do not have educational qualifications. Many of the academics in the college prefer to do research on their various areas of subject matter than to strengthen their pedagogical abilities.

On the contrary, for both PK2 (they found it challenging to align learning activities with teaching methods) and PK3 (they find it difficult to adapt their teaching styles to different learners), the respondents disagreed with the statements, which meant that 67% (PK2) did not find it difficult to align learning activities with teaching methods. The responses by the College academics confirmed their dedication in doing their best to serve their students to acquire knowledge that would make them relevant to industry.

Equally important, 58% of responses pointed out that the participants did not find it difficult to adapt their teaching styles to different learners (PK3). The responses also confirmed how dedicated the College academics were in making sure that various students at different learning levels could benefit from their lessons. As a result, most academics employed the scaffolding (Anderson, 2019: 175-183) teaching approach to make sure that students who took longer to grasp some contents also received assistance. It is of vital importance to note that scaffolding varies between students, between words for the same student, and between time for individual students. In this strategy, academics treat students as individuals and patiently assist them to understand content and make them become independent (Scanlon, Anderson, & Sweeney, 2017). However, only a few academics can employ this teaching and learning approach as they have learned it during their educational qualification.

Hence, an encouragement for all staff members at the College to register for online qualifications in order to properly teach their students.

It takes extraordinarily talented academics to accommodate such students. Most of the academics found it time-consuming to cater for students who required extended lessons. It was an unfortunate situation that two (PK4 & PK6) categories out of six categories (PK1, PK2, PK3, and PK5) received negative responses. 44% of the respondents agreed that they marvelled at other lecturers' curriculum development as they easily matched content with teaching strategies (PCK4). It gave the impression that most of the remaining participants were already satisfied with their curriculum development strategies. It is of vital importance that academics who struggled with their curriculum development should closely work with those who are excelling, so that students could benefit after all. Regarding PCK6, most participants agreed that they struggled to make use of the different ranges of teaching approaches. This normally happens to people who are reluctant to try something new, due to lack of training and not being exposed to appropriate educational qualifications. The responses gave evidence that most of the College academics did not have formal qualifications and lacked the drive to work with other academics.

Research sub-question 4: How much knowledge do the College **academics command to integrate technological, pedagogical and content knowledge (TAPCK) into the teaching and learning (ODeL) institution?**

In answering the question of how much knowledge the College academics command to integrate technological, pedagogical and content knowledge (TAPCK) into the teaching and learning (ODeL) institution, the respondents in all three (TPACK1, TPACK2 and TPACK3) categories responded positively, above 50%. On the issue of category TPACK1, 59% of the responses agreed that they taught lessons that appropriately combined technology and teaching approaches. Many of the academics at the College indicated that they preferred to combine teaching technologies with teaching approaches which is in line with the study conducted by Wang, Wang *et al.,* (2019: 363-384). However, for any academic to be able to complement teaching approaches with technological tools they would require technological skills to appropriately facilitate teaching and learning, as confirmed by Wang *et al*. (2019:363-384).

The College frequently offers teaching technological tools training to equip academics to present content while utilising various teaching approaches for students to easily gain

knowledge, as is consistent with the study conducted by González-Sanmamed, *et al.* (2014). Most of the academics at the College who have educational qualifications can confidently use various teaching approaches to create conducive environments for teaching and learning. Academics using technologies such as video conferencing know which modules or subjects are teachable on that platform and they agree with other researchers who have demonstrated that professional development provides academics with new instructional materials and practices that support change in knowledge and beliefs (Gess-Newsome, et al., 2019: 944-963).

It is of vital importance to integrate technology with pedagogical strategies to impart content knowledge to learners and to inspire active learning (Nouri, McComas, & Aponte-Martinez, 2019: 367-389). The study conducted by Jones, Moeeni and Ruby (2020) confirms that the role of the instructor in a face-to-face teaching environment is as important as in web-based teaching and learning settings regarding administering teaching activities. This also signifies the important role of the instructors' understanding the content knowledge and of being able to find appropriate teaching approaches to better share the information with students. As a result, faculties must facilitate an integrated approach whereby educational consultants work together with the academics to properly develop a customised digital resource for students to use (Wang et al., 2019: 363-384). The consultants in the module development team bring along the pedagogical flavour to show academics how the best teaching approaches can be integrated. Hence, the results seem to be gradually improving regarding teaching approaches.

Regarding TPACK2, 61% of respondents agreed that they were not well prepared to manage educational changes that technology brought in the teaching and learning space. In most cases, academics who worked longer in the academic environment were not eager to let go of their old manual notes and textbooks which they had used while they were still at school. As a way forward for technological advancement, 54 other institutions offer virtual technological tools such as computer graphics, augmented reality, computational dynamics, virtual worlds and robotics as options to embrace the issue of practical use in the fields of engineering and sciences (Downey, Skophammer, Reed, Martin, Ritz, Kosloski, Antonioli, Blake & Sparks, 2014). It is apparent that even though CEST academics seem not yet prepared to accept technological change based on the TPACK2 category, other institutions of the world are transforming. The longer the academics take to adapt to technological advancements the longer they delay their students' better learning. These technologies such as augmented reality,

virtual reality, robotics, etc. makes learning exciting for students but they also demand more time for academics to research and design. Hence, the passion and interest of the academics, or lack thereof, becomes apparent. It is indicated that online learning requires training and instruction on how to design and organise online teaching to increase the students' performance, but academics with negative attitudes towards technology can remain a stumbling block (Wang *et al.,* 2019: 363-384).

It is concerning that most participants did not see technology as an enabling element towards teaching and learning but as a threat to them. The challenges faced by the College academics are consistent with the study conducted among Chinese instructors with regard to online teaching competencies (Wang *et al.,* 2019: 363-384), and also those in Spain (González-Sanmamed *et al*., 2014: 162–187). It is of vital importance that academics remain trained in order to actively coordinate students' engagements to ensure continuous learning (Wang, *et al*., 2019: 363-384). This shows that challenges experienced by the College academics are common to other academics in other institutions. However, it should be emphasised that the onus remains with academics themselves to change their attitudes towards technology and be able to put students at the centre of learning. Teaching and learning environments are no longer stagnant but are continuously evolving with the emergence of technology (Clarke, Nielsen, Collins, Mena, Hoban, & Shea, 2017: 346–368). It is of vital importance for academics to begin to think of how their students can benefit from technology advancement.

In the category TPACK3, 52% of the respondents agreed that technology integration into teaching and learning remained a challenge for them. It is evident that only a few people at The College seem to be passionate about technology related activities such as attending OERs training, Knovel training, SAMIGO training, publishers teaching platform training etc. The study conducted by Lavadia (2016) agrees that in the science-related institutions the integration of digital technology through simulation software; data collection, analysis, and synthesis; and case studies and assessments are utilised to enhance teaching and learning. In this instance, science and engineering students are afforded an opportunity to gain practical experience when they physically interact with apparatus or equipment to practice a learned theory. Students' understanding of various concepts is thereby broadened and expanded. However, on the side of the academics it might seem to be a lot of work. Hence, academics need to be passionate before they become involved in technology integrated learning. In this digital age of the 21st Century, people are now using virtual reality and augmented reality for

teaching and learning. These virtual tools allow students to get hands-on experience on various concepts and assist them to gain understanding.

The nature of the teaching and learning environment at the College revolves around engineering education where a traditional lecture-style method is fused with practical learning (Tejado & Pérez, 2020). Many of the core modules in science and engineering at the College carried both theoretical and practical elements of learning. It is therefore imperative that all academics become mindful of the environment of teaching and learning in order to find ways of making practical what students learn from the theory. The Institution, as a distance learning institution, is more suited for virtual teaching tools. hence, the importance that academics explore various laboratories available and suitable for their modules. Learning is depicted by three main methodology laboratories; these are approaches with hands-on laboratories, remote laboratories, as well as virtual ones (Heradio, de la Torre, Dormido, 2016:1-10). As elaborated before, the nature of the Institution as a distance institution is preferred by students globally. The choice of laboratory should be suitable for all the students. As it stands now, all practicals are done at the Florida campus but other modes are explored by taking advantage of the technology. Based on the results, 52% of the respondents find technology integration challenging, which gives the impression that the technology integration journey is still a long one.

According to Mason, Pegler and Weller (2005: 97-105), online teaching and learning include online assessments such as e-portfolios, online quizzes, and online summative assessments (Einig, 2013). Traditional academics are used to and comfortable with manual ways of teaching, hence the results in category TPACK3. It is also important to mention that the College has been on the journey of transitioning to fully online for some time. The outbreak of the corona virus is enforcing pressure on the College to consider online summative assessments. However, most of the academics are still comfortable with teaching the students using the old traditional way. The Institution has invested in teaching and learning technologies, such as top of the range virtual video conferencing equipment, that allow students in various regions around the continent to attend classes. These students can access videoed lessons in their own time and in the comfort of their own spaces. Hence, academics are encouraged to slowly venture into technological advances to better cater for the digital age students. Academics are encouraged to replace the face-to-face teaching with the learning management system where all teaching activities take place as discussed in the research

background section. Academics are gradually adapting to online delivery based on teaching lessons, assignment submission and marking, as well as online examination.

5.2 CONCLUSION

This section covers the extent of knowledge that the College academics possess in order to create a conducive environment for teaching and learning. The questions the study is striving to answer are alluded to above. However, summaries of the responses to these questions are discussed below.

Regarding TK, many of the participants indicated to be anti-technology, and few showed interests in technological advancement. The minority of these academics took time to understand various available technologies in order to enhance teaching and learning. The results also show that few academics are currently using the available resources such as video conferencing equipment, podcasts etc. It is the responsibility of the academics to test these technologies before using them in class.

Under the category of CK, the results gave the impression that academics understood their content very well and tried to share their knowledge with their students. Few of the academics still struggle to understand the importance of mastering content in empowering students. The results showed that a few people lack educational qualifications needed to make them realise the importance of having positive attitudes towards students.

Regarding PK, a very few academics tried various strategies to help students understand content. The results also show that most academics did not go out of their way to make teaching and learning interesting to students because they lacked teaching competencies due to a lack of formal education qualifications. Most of the academics come from industry and a face-to-face environment and lacked understanding of the distance learning environment.

Regarding the knowledge that The College academics command: based on the results, it shows that most of the academics are well acquainted with technology integration. It looks like academics are gradually integrating various teaching approaches to make teaching and learning pleasurable for the students. The results also show that academics with positive attitudes towards technology integration are those with educational qualifications and they

adhere to developmental training programmes. Other institutions are also taking advantage of virtual technologies such as augmented reality and virtual laboratories, while others like The College are reluctant to do so.

CHAPTER SIX

CONCLUSION, RECOMMENDATIONS AND STUDY BENEFITS

6.1 INTRODUCTION

It is of vital importance to indicate that the current study employed technological knowledge, pedagogical knowledge, content knowledge and the technological pedagogical content knowledge (TPACK) framework to determine academics' knowledge on technological, pedagogical and content integration in teaching and learning in the College at the Institution.

The study covered the background on the importance of ODeL following the transition from the traditional mode of education to accommodating the diverse needs of the students. The digital age of the 21st Century is gradually enforcing pressure on the educational institutions to respond by employing ICTs in creating conducive environments for teaching and learning.

The underlying research question is stated as *What is the baseline knowledge* the College *academics possessed regarding TPACK integration in teaching and learning?* and the sub-questions are as follows:
Do academics at The College possess technological knowledge (TK) to create a conducive environment for teaching and learning at an ODeL?; How much content knowledge (CK) do The College academics have in relation to teaching and learning at an ODeL environment?; How aware are academics at The College of pedagogical knowledge (PK) in creating a conducive environment for teaching and learning at an ODeL?; How much knowledge do the College academics command to integrate technological, pedagogical and content knowledge (TAPCK) within the teaching and learning (ODeL) institution?

The answers to the set research questions above assisted in satisfying the objectives highlighted below:

- To determine if the College academics possessed technological knowledge to create a conducive environment for teaching and learning at an ODeL institution.
- To determine if the College academics possessed content knowledge to create a conducive environment for teaching and learning at an ODeL institution.
- To determine if the College academics possessed pedagogical knowledge to create a conducive environment for teaching and learning at an ODeL institution.

- To identify an effective way of integrating technological, pedagogical and content knowledge with teaching and learning for the ODeL institution.

The current section covers conclusions, recommendations and the suggestions of the further study as well as the benefits of the study.

6.2 CONCLUSION

It is therefore of vital importance to evaluate if the current study satisfied the anticipated objectives of the study. In answering the major research question of the study, all the responses of the sub-questions were thoroughly analysed. The most general outline about the College academics' knowledge on technology, pedagogical and content integration shows that they were mindful of the importance of technology towards teaching and learning. However, most of them lacked the know-how since they did not have educational qualifications related to the online learning environment. It is worth mentioning that most of the College academics come from industry and traditional face-to-face institutions without the comprehension of how online distance learning operates.

It is of vital importance to state that orientations for all new staff members at the College were provided with the available resources regarding teaching and learning. However, it remained the responsibility of academics on how to navigate the system to position themselves on how they can best execute their mandates of equipping students with knowledge as is consistent with Liao and Lu (2008: 1405-1416). As such, some of those academics resorted to understanding how the ODeL environment works in order to better equip themselves so that they can provide services expected in meeting the needs of the students. Committed and dedicated academics enrolled themselves for formal online learning qualifications that the institution provided through its partnership with institutions such as the University of Maryland University and the University of Oldenburg. However, others opted to utilise their underlying experience from their traditional face-to-face environment which in most cases proved to be irrelevant and insufficient.

The central reality of the 21st century is the emergence of the knowledge economy. The statement above bears reference to the importance of academics empowering themselves in order to remain relevant regarding their knowledge to be suited to the digital age students in the institution of higher learning (Altbach, Reisberg, Rumbley, 2019). According to Altbach *et al.* (2019), highly trained academics are required in this current knowledgeable economy in

order to enforce global mobility. This means that institutions with underqualified academics will compromise the quality of education offered to the student community. These institutions with underqualified academics may struggle to compete globally. As indicated earlier in the results and discussions, The College academics are mindful of what the current technological dispensation of teaching and learning requires but lack passion and commitment. The Institution and the College offer opportunities for academics to register with the online learning institutions in partnership with such University of Maryland University College and University of Oldenburg, but there was little interest. This finding is inconsistent with Liao and Lu (2008: 1405-1416).

The findings of the study further indicated that the participants lacked interest regarding technology and considered it a waste of time as confirmed by Chute *et al*. (1999). Many of the College academics were more concerned about the time required to gain knowledge on available technologies and did not think of the students who were depending on them. Students that come from these institutions may struggle to be recognised worldwide as they will lack knowledge. It is observed that universities with well-educated and committed academic professionals are succeeding (Altbach *et al*., 2019). It is also confirmed that most academics in numerous developing countries only have bachelor's degrees and this is in accordance with the College academics as confirmed by King (2002, 283-297). Many of the academics at the College have been struggling for years to acquire their higher qualifications. Their lack of enthusiasm might deter them from researching ways of improving their teaching methods as established by Mishra and Koehler (2006: 1017-1054). However, it is also stated that the numbers of part-time academics are increasing in many countries (Altbach *et al*., 2019). Countless literatures bear reference that the College academics need to change their methods of conducting teaching and learning if they want to remain relevance and produce graduates that can add value in the industries which will absorb them. The universities operating as distance learning institutions have developed various strategies to benefit from this new global environment that attracts students interested in part-time education (Altbach et.al. (2019). Academics at the current institution are required to be flexible enough to move with the times and become technologically savvy in order to develop study materials conducive for the 21st digital environment, as concurred by Chute *et al*. (1999).

The College is currently enforcing relations with various publishers to offer online textbooks and teaching and interactive platforms for academics to easily utilise for teaching and learning.

E-resources books such as boobooks and knovel are also utilised by the college to assist academics with resources they can employ for teaching and learning as concurred by Molinillo et al. (2018:41-52). Liu et al. (2015:55-74) and Mishra and Koehler (2006: 1017-1054) further confirmed that the effectiveness of the e-learning environment is due to the involvement of resources such as e-books and other e-assessments towards enrichment. However, these initiatives require academics who value technology integration for teaching and learning. In the words of Altbach et.al. (2019), highly top ranked research-intensive universities are found to be centred around academic systems. It is also emphasised that any world class university should put emphasis on activities such as teaching, public service and provide accessibility to various communities (Altbach et.al. (2019). However, in the college where this research was conducted, academics believe in choosing either research or teaching. Hence, the results of the study give an impression that academics at the College still do not value technology as a tool that can assist in helping them teach better. Some of these academics still see technology as a time waster rather than a teaching and learning enhancing tool.

The current study utilised the TPACK framework in achieving the set objectives. As such, the primary objective proved that the academics at the College lacked the comprehension of what technology integration in teaching and learning can do for the institution of higher learning. Nevertheless, the TPACK framework remains an appropriate tool to assess technology integration in the teaching and learning environment. According to Glowatz and O'Brien (2017: 133-159), TPACK proposes that for teaching to be effective in this digital age it requires technological knowledge. As a result, without technology engagement, teaching opportunities fade away. Glowatz and O'Brien (2017: 133-159) further point out that the use of the TPACK framework by educators assists in the awareness and the understanding of the teaching context. It is emphasized that a lack of technological knowledge by academics can cause a digital divide when young incoming students possess high technological skills. This may cause students to begin to undermine academics who are less interested in technology and can destabilise the teaching and learning environment. In this study, the College academics did not demonstrate their awareness of the TPACK framework, as was discovered during the informal interaction with most academics and by others who confessed their passion to be in their area of research rather than on teaching.

6.3 RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDY

The current study successfully utilised the TPACK framework to assess the College academics' knowledge of technology, pedagogical and content integration in teaching and learning. It is evidence that the College academics are aware of what technology can do to influence teaching and learning but considered it as more work on their side and as a result resistance emerged instead. This statement is in consistence with Collis (1995:136-149); that technology integration succeeds when there is positive involvement by academics and top management.

According to Hardy and Tolhurst (2014: 265–289), academics should be supported and empowered regarding their digital approach to teaching and learning, through continuous professional development. It is also mentioned that many universities do offer contractual positions but without any promise of permanent positions, as supported by Mishra and Koehler (2006: 1017-1054). Additionally, other institutions in the United States of America hire academics with tenured contractual mandates but based on qualification acquisition. Currently it is a challenge to have staff members who joined the institution for many years but are still without the attainment of the higher and expected qualification, as confirmed by Altbach et.al. (2019).

It has also been stated that many institutions which do not embrace ICT as a way of business operations might soon be rendered obsolete (Jabbar & Hardaker 2013:1-3). Recently, the internet of things has helped knowledge communication in the institution of higher learning improve. Many institutions are beginning to see distance education as an option to replace traditional teaching and learning. It is of vital importance that every technological or pedagogical intervention is supported by institutional policies and procedures (Jabbar & Hardaker 2013:1-3).

Based on many deliberations in literature and the research findings, the current research study recommends that academics should consider putting their students in the centre of teaching and learning and begin to see the need to understand the TPACK framework which will make them aware of the of the important role that technology can play in their pedagogy and content. These findings are in line with the conclusions by researchers such as Webster and Hackley (1997: 1282-1309), Algahtani (2011), and Bailey and Card (2009:152-155) that the success

of e-learning depends upon the attitude towards technology, teaching style and control of the technology.

This research study, therefore, recommends that technology should not be viewed as a remedy to all teaching and learning challenges, but as an enabling tool that must be applied efficiently and appropriately alongside pedagogical design, research and practice.

Based on the recommendations above, the researcher suggests that a university-wide study be conducted in order to give a full view on where the Institution is regarding technology integration.

The current study rightfully proposed the utilisation of the TPACK framework in order to analyse the working environment at the College. It is important to note that the highlighted literature review brings out technological issues coverable by the seven elements of the TPACK framework. The belief system and attitude of academics regarding technology integration with reference to the needs of the students makes all the difference. The present study envisages that the adoption of the TPACK framework will awaken the College academics regarding technology integration in order to map out a way forward for the Institution community.

6.4 RESEARCH STUDY BENEFITS

The knowledge gained in this study will assist the researcher to encourage colleagues to begin to view technology differently and to attend the LMS tools training and other virtual training such as OERs, Knovel, and publisher-based teaching and learning platforms. It is also believed that the College management will now understand how academics see and value technology. The researcher also believes that the academics will see where other institutions are regarding technology and begin to understand the importance of equipping students by creating an environment conducive for teaching and learning. The study coincides well with the new technological developments regarding online assessments in the institutions caused by the breakout of the coronavirus known as COVID-19. The Institution, like other institutions of the world, is bracing itself technologically to be fully online so that teaching and learning can be fully online. It is indeed an opportunity that some findings in the study can be used to better improvise the current resources with what will be required from now on.

REFERENCES

Algahtani, A., 2011. Evaluating the E ectiveness of the E-learning Experience in Some Universities in Saudi Arabia from Male Students' Perceptions.

Ali, S., Uppal, M.A. & Gulliver, S.R., 2018. A conceptual framework highlighting e-learning implementation barriers. Information Technology & People.

Archambault, L. & Crippen. K. 2009. Examining TPACK among K-12 Online Distance Educators in the United States. Contemporary Issues in Technology and Teacher Education 9(1): 71–88.

Atieno, O. P. 2009. An Analysis of the Strengths and Limitation of Qualitative and Quantitative Research Paradigms. Problems of Education in the 21st Century 13: 13–18.

Akman, Ö. & Güven, C. 2015. TPACK Survey Development Study for Social Sciences Teachers and Teacher Candidates. International Journal of Research in Education and Science. 1(1):1–10. [Online], Available: http://files.eric.ed.gov/fulltext/ED548292.pdf.

Alise, M.A. & Teddlie, C. 2010. A Continuation of the Paradigm Wars? Prevalence Rates of Methodological Approaches Across the Social/Behavioral Sciences. Journal of Mixed Methods Research. 4(2):103–126.

Alshenqeeti, H. 2014, Interviewing as a data collection method: A critical review. English Linguistics Research 3(1).39-45.

Altbach, P.G., Reisberg, L.& Rumbley, L.E., 2019. Trends in global higher education: Tracking an academic revolution. Brill.

An, Y.-J. & Reigeluth, C. 2011. Creating Technology-Enhanced, Learner-Centered Classrooms. Journal of Digital Learning in Teacher Education. 28(2):54–62.

Anderson, K.L. 2019.Explicit instruction for word solving: Scaffolding developing readers’

use of code-based and meaning-based strategies. Preventing School Failure: Alternative Education for Children and Youth, 63(2), pp.175-183.

Anderson, T. & Dron, J. 2011. Three Generations of Distance Education Pedagogy.

Anderson, C., 2010. Presenting and Evaluating Qualitative Research. Journal List

Am J Pharm Education 74(8).

Arnold, M., Gibbs, M. & Shepherd, C. (in press). Domestic ICTs, desire and fetish. The

Fibreculture Journal. 9(59):online. [Online], Available: http://nine.fibreculturejournal.org/fcj-059-domestic-icts-desire-and-fetish/.

Atieno, O.P. 2009. An analysis of the strengths and limitation of qualitative and quantitative

research paradigms. Problems of Education in the 21st Century. 13:13–18. [Online], Available: http://www.scientiasocialis.lt/pec/files/pdf/Atieno_Vol.13.pdf.

Bailey, C. J., & Card, K. A. (2009). Effective pedagogical practices for online teaching:

Perception of experienced instructors. Internet and Higher Education, 12, 152-155.

Bangert, A. W. (2004). The seven principles of good practice: A framework for evaluating

on-line teaching. Internet and Higher Education, 7, 217-232. doi:10.1016/j.iheduc.2004.0.003

Bates, A.T., 2018. *Teaching in a digital age: Guidelines for designing teaching and learning*.

for a digital age. Tony Bates Associates. [Online], Available:

https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Teaching+in+a+digital+age%2C+Bates&btnG=

Bates, A.W., 2015. Teaching in a digital age. BC Open Textbooks. Retrieved May 2020..

https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Teaching+in+a+digital+age%2C+Bates&btnG=

Bates, T. 2008. The Transformation of Teaching and Learning at a Distance Introduction. The

international handbook of distance education. 218–235.

Bernstein, H. 1987. The Freedom Charter. Third World Quarterly. 9(2):672–677.

Berry, S., 2019. Professional development for online faculty: instructors' perspectives on cultivating technical, pedagogical and content knowledge in a distance program. Journal of Computing in Higher Education, 31(1), pp.121-136.

Chai, C.S., Koh, J.H.L. & Tsai, C.-C. 2013. A Review of Technological Pedagogical Content Knowledge. Educational Technology and Society. 16(2):31–51.

Chang, Y., Jang, S.J. & Chen, Y.H. 2015. Assessing university students' perceptions of their Physics instructors' TPACK development in two contexts. British Journal of Educational Technology. 46(6):1236–1249.

Chilisa, Bagele & Barbara Kawulich. 2015. "Selecting a Research Approach." (January 2012):1–21. https://www.academia.edu/15804348/Selecting_a_research_approach_Paradigm_methodology_and_methods.

Chimo, D.M. 2012. Effects of Web 2.0 technology on student learning in science. professional paper, MOntana State University. (July):1–56.

Clarke, A. Nielsen, W. Collins, J. Mena, J. Hoban, G. O'Shea, S. 2017. Australia's supervising teachers: motivators and challenges to inform professional learning. Asia-Pacifc J. Teachnol. Educ. Vol. 45, pp. 346–368.

Collis, J. & Hussey, R., 2003, Business research: A practical guide for undergraduate and post graduate students, Hemisphere, New York, N.Y.

Council on Higher Education (CHE). 2014. Distance Higher Education Programmes in a Digital Era: Good Practice Guide. Pretoria: CHE.

Creswell, J.W., 2014, Research design: Qualitative & quantitative approaches, Sage, London. (3rd ed.). Thousand Oaks, CA: Sage

Crotty, M., 1998, The foundations of social research, Sage, London.

Cohen, L., Manion, L., & Morrison, K. 2007. Research methods in education. London: Routledge.

Chute, A.G., Thompson, M.M., & Hancock, B.W. 1999. The McGraw-Hill handbook of distance learning. New York: McGraw-Hill.

Dela Pena-Bandalaria, M. 2013, „Collaboration In Online Courses: Drawing Insights From The Learners For Effective Course Design“, in Proceedings of the 2013 IEEE 63rd Annual Conference International Council for Education Media, ICEM 2013, pp. 1-6.

Downey, S. Skophammer, R. Reed, P.A. Martin, G. Ritz, J. Kosloski, M. Antonioli, M. Blake, C. and Sparks, K. 2014. 54 History of the (Virtual) Worlds. History, vol40.

Duran, M., & Fossum, P. R. 2010. Technology integration into teacher preparation: Part 1- Current practice and theoretical grounding for pedagogical renewal. Öğretmen Eğitiminde Bilgi ve İleti ş im Teknolojileri Entegrasyonu: Böl ü m 1-Mevcut Uygulamalar ve Pedagoji Değişimi İçin Model Önerisi, 11(2), 209–228.

Edgerton, R. 1998. Education white paper. Paper presented to the Pew Charitable Trust, 1998. [Online], Available: http://faculty.umb.edu/EdgertonHigherEducationWhitePaper.rtf

Einig, S. 2013. Supporting students' learning: The use of formative online assessments. Accounting Education, vol, 22. pp. 425-444.

Ertmer, P. A., Ottenbreit-Leftwich, A., & York, C. 2006. Exemplary technology-using teachers: Perceptions of factors influencing success. Journal of Computing in Teacher Education, 23(2), 55–61.

Evens, M., Tielemans, K., Elen, J. & Depaepe, F., 2019. Pedagogical content knowledge of French as a foreign language: differences between pre-service and in-service teachers. Educational Studies, 45(4), pp.422-439.

Farrell, P., Dyson, A., Polat, F., Hutcheson, G. & Gallannaugh, F., 2007. Inclusion and achievement in mainstream schools. European Journal of Special Needs Education, 22(2), pp.131-145.

Federal Government of Nigeria, 2004. National Policy on Education. Abuja: NERDC Press

Fransson, G., & Holmberg, J. 2012. Understanding the theoretical framework of technological pedagogical content knowledge: A collaborative self-study to understand teaching practice and aspects of knowledge. Studying Teacher Education, 8(2), 193–204.

Fontanilla, H.S. 2016. Comparison of Beginning Teachers' and Experienced Teachers' Readiness to Integrate Technology as Measured by TPACK Scores. ProQuest Dissertations and Theses. 176. [Online], Available: http://libproxy.library.wmich.edu/login?url=https://search.proquest.com/docview/1752252626?accountid=15099%0Ahttp://primo-pmtna01.hosted.exlibrisgroup.com/openurl/01WMU/01WMU_SERVICES??url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genr.

Fullan, M., Langworthy, M. & Barber, M., 2014. A rich seam. How New Pedagogies Find Deep Learning. Recuperado de http://www. michaelfullan. ca/wp-content/uploads/2014/01/3897. *Rich_Seam_ web. pdf*.

Garrison, R., & Kanuka, H. 2004. Blended learning: Uncovering its transformative potential in higher education. Internet and Higher Education, 7.

Georgina, D., & Hosford, C. 2009. Higher education faculty perceptions on technology integration and training. Teacher and Teacher Education, 25(5), 690–696.

Gess-Newsome, J., Taylor, J.A., Carlson, J., Gardner, A.L., Wilson, C.D. and Stuhlsatz, M.A. 2019. Teacher pedagogical content knowledge, practice, and student achievement. International Journal of Science Education, 41(7), pp.944-963

Glowatz, M. and O'Brien, O., 2017. Academic engagement and technology: Revisiting the technological, pedagogical and content knowledge framework (TPACK) in higher education (HE): The academics' perspectives. IAFOR Journal of Education, 5, pp.133-159.

González-Sanmamed, M., Muñoz-Carril, P.-C., & Sangrà, A. 2014. Level of proficiency and professional development needs in peripheral online teaching roles. The International Review of Research in Open and Distributed Learning, 15(6), 162–187.

Grix, J. 2010. The foundations of research. London: Palgrave Macmillan.

Guba, E. G., & Lincoln, Y. S. 1989. Fourth generation evaluation. Newbury Park, CA: Sage.

Gumbo, M.T. 2016. Online learning Experiences of Students in the MED in Open and Distance Learning – A Phenomenography of the dual University initiative. (September).

Günther, S.L., Fleige, J., zu Belzen, A.U. and Krüger, D., 2019. Using the case method to foster preservice biology teachers' content knowledge and pedagogical content knowledge related to models and modeling. Journal of Science Teacher Education, 30(4), pp.321-343.

Hardy, C., and D. Tolhurst. 2014. Epistemological Beliefs and Cultural Diversity Matters in Management Education and Learning: A Critical Review and Future Directions. *Academy of Management Learning & Education* 13 (2): 265–289.

Harris, J., Mishra, P. and Koehler, M., 2009. Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. Journal of research on technology in education, 41(4), pp.393-416.

Hennessy, S., Ruthven, K., and Brindley, S. 2005. Teacher perspectives on integrating ICT into subject teaching: commitment, constraints, caution, and change. Journal of Curriculum Studies, 37(2), 155–192.

Hermans, H. 2015. OpenU: design of an integrated system to support lifelong learning. [Online], Available: http://dspace.ou.nl/handle/1820/5998.

Heradio, R, de la Torre, L, Dormido, S. 2016. Virtual and remote labs in control education: a survey. Annu Rev Control, pp, 1–10.

Heydenrych, J.F. & Prinsloo, P. 2010. Revisiting the five generations of distance education : Quo vadis ? Progressio. 32(1):5–26.

Hlagala, A.R. 2015. Mobile educational technologies currently used as a means to enhance

teaching and learning in a privileged high school. (February). [Online], Available: http://uir.”The Institution”.ac.za/handle/10500/19206.

Hofer, M., & Grandgenett, N. 2012. TPACK Development in Teacher Education: A Longitudinal Study of Preservice Teachers in a Secondary M.A.Ed. Program. Journal of Research on Technology in Education (International Society for Technology in Education), 45(1), 83–106.

Holmberg, B. 1995. The Evolution of the Character and Practise of Distance Education. Open Learning. 10(2):47–53.

Hughes, A. 2009. Higher education in a digital Web 2.0 world. Joint Information Systems Committee.

Hussain, M. A., Elyas, T., & Nasseef, O. A. 2013. Research Paradigms: A Slippery Slope for Fresh Researchers. Life Science Journal 10(4), 2374-2381.

Igbafe, E.C., 2016. Emotional intelligence in coping with professional academic and institutional challenges in Nigerian universities (Doctoral dissertation, University of Pretoria).

Isabirye, A.K. 2015. Staff development for innovative teaching and learning at the University of South Africa. (February):321.

Jacob, P., Siyathuthuka, Z. & Gcis, J.Z. 2017. Zuma : Free higher education for all poor students within five years Scepticism greets Zuma ’ s free higher education announcement. (December).

Jabbar, A. and Mirza, M., 2019. Managing diversity: academic’s perspective on culture and teaching. Race Ethnicity and Education, 22(5), pp.569-588.

Jamieson-Proctor, R., Albion, P., Finger, G., Cavanagh, R., Fitzgerald, R., Bond, T. & Grimbeek, P. 2013. Development of the TTF TPACK survey instrument. Australian Educational Computing. 27(3):26–35.

Jimoyiannis, A., Tsiotakis, P., Roussinos, D. & Siorenta, A. 2013. Preparing teachers to

integrate web 2.0 in school practice: Toward a framework for pedagogy 2.0. Australasian Journal of Educational Technology. 29(2):248–267.

Jones, K.R., Moeeni, F. and Ruby, P. 2020. Comparing web-based content delivery and instructor-led learning in a telecommunications course. Journal of Information Systems Education, 16(3), p.4.

Kali, Y., Sagy, O., Kuflik, T., Mogilevsky, O. & Maayan-Fanar, E. 2015. Harnessing technology for promoting undergraduate art education: A novel model that streamlines learning between classroom, museum, and home. IEEE Transactions on Learning Technologies. 8(1):5–17.

King, K. P. (2002). Keeping pace with technology. Cresskill, NJ: Hampton Press

Kivunja, Charles, and Ahmed Bawa Kuyini. 2017. "Understanding and Applying Research Paradigms in Educational Contexts." International Journal of Higher Education 6(5): 26.

Khan, S. 2011. New pedagogies on teaching science with computer simulations. Journal of Science Education and Technology, 20(3), 215–232.

Koehler, M.J. & Mishra, P. 2009. What is Technological Pedagogical Content Knowledge? Contemporary Issues in Technology and Teacher Education. 9(1):60–70.

Kop, R., 2011. The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. The International Review of Research in Open and Distributed Learning, 12(3), pp.19-38.

Kothari, C.R., 2004, Research methodology: Methods & techniques, New age international publishers, New Delhi.

Kuhn, T. S. 1970. The structure of scientific revolutions (2nd ed.). Chicago: University of Chicago Press.

Kumar, R., 2011, Research Methodology: A Step-by-Step Guide for Beginners. 3rd Edition. Sage, New Delhi

Lenkaitis, C.A., 2019. Technology as a mediating tool: videoconferencing, L2 learning, and learner autonomy. Computer Assisted Language Learning, pp.1-27.

Lim-fei, V. 2017. Massive Open and Online Courses and Open SEAMEOJournal Massive Open and Online Courses and Open Education Resources in Singapore. (August):1–10. [Online], Available: https://arxiv.org/ftp/arxiv/papers/1708/1708.08743.pdf.

Ling Koh, J.H., Chai, C.S. & Tay, L.Y. 2014. TPACK-in-Action: Unpacking the contextual influences of teachers' construction of technological pedagogical content knowledge (TPACK). Computers and Education. 78:20–29.

Liu, Q., Zhang, S., & Wang, Q. 2015. Surveying Chinese in-service K12 teachers' technology, pedagogy, and content knowledge. Journal of Educational Computing Research, 53(1), 55–74

Maeng, J.L., Mulvey, B.K., Smetana, L.K. and Bell, R.L., 2013. Preservice teachers' TPACK: Using technology to support inquiry instruction. Journal of Science Education and Technology, 22(6), pp.838-857.

Mafenya, N.P. 2016. Effective assessment in Open Distance and E-Learning: Using the signature courses at the University of South Africa as a model for future practice. (June).

Majid, N.A.A. 2014. Integration of Web 2 . 0 Tools in Learning a Programming Course. TOJET: The Turkish Online Journal of Education Technology. 13(4):88–94.

Malik, S., Rohendi, D. and Widiaty, I., 2019, February. Technological pedagogical content knowledge (TPACK) with information and communication technology (ICT) integration: A literature review. In 5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018). Atlantis Press.

Mason, R.D., Pegler, C.A. and Weller, M.J. 2005. A learning object success story. Journal of Asynchronous Learning Networks, vol 9. pp.97-105.

Mbatha, B. 2014. Global transition in higher education: From the traditional model of learning

to a new socially mediated model. International Review of Research in Open and Distance Learning. 15(3):257–274.

Mbati, L, S. 2013. Exploring media blends for constructivist learning in open and distance and e-Learning (ODeL) Environments. University of South Africa. [Online], Available: http://hdl.handle.net/10500/13724.

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M.K., Franey, J.J. & Bassett, K. 2016. Teaching in a Digital Age: How Educators Use Technology to Improve Student Learning. Journal of Research on Technology in Education. 48(3):194–211.

McLoughlin, C.E. & Alam, S.L., 2019. A case study of instructor scaffolding using Web 2.0 tools to teach social informatics. Journal of Information Systems Education, 25(2), p.4.

McMillan, J. & Schumacher, S. 2014. Research in Education James McMillan Sally Schumacher. In Pearson Ed ed. J. McMillan & S. Schumacher (eds.). United States of America: Pearson New International Edition Research in Education Evidence Based Inquiry. 159–163. [Online], Available: https://files.pearsoned.de/ps/ext/9781292035871.

Minnaar, A. 2011. Student support in e-learning courses in higher education - insights from a metasynthesis "A pedagogy of panic attacks. Africa Education Review. 8(3):88–108.

Molinillo, S., Aguilar-Illescas, R., Anaya-Sánchez, R. and Vallespín-Arán, M., 2018. Exploring the impacts of interactions, social presence and emotional engagement on active collaborative learning in a social web-based environment. Computers & Education, 123, pp.41-52.

Moore, V. & Serfin, M. 2017. An Examination of the Correlation between Teacher Perception of Technology Integration and Student Success on Standardized Achievement Tests. (2005).

Mpofu V, Samukange T, Kusure LM, Zinyandu TM, & Denhere C. 2012. Challenges of virtual and open distance science teacher education in Zimbabwe. The International Review of Research in Open and Distance Learning, 13 (1): 207-219.

Ng'ambi, D., & Bozalek, V. 2013. Leveraging informal leadership in higher education institutions: A case of diffusion of emerging technologies in a southern context. British Journal Of Educational Technology, 44(6), 940–950.

Ngubane-Mokiwa, S. & Letseka, M. 2015. Shift from open distance learning to open distance e-learning. Open Distance Learning (ODL) in South Africa. (January):129–142. [Online], Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84956824057&partnerID=40&md5=d7a87b43d3571f75cb62519da99fb6ab.

Nieuwenhuis, J. 2007. Qualitative research designs and data gathering techniques in First Steps in research: Introducing qualitative research. Pretoria: Van Schaik.

Nouri, N., McComas, W.F. & Aponte-Martinez, G.J., 2019. Instructors' Rationales and Strategies for Teaching History of Science in Preservice Settings. Science & Education, 28(3-5), pp.367-389.

Nyerere J.K.A, Gravenir F.Q, & Mse G.S. 2012. Delivery of open, distance, and e-learning in Kenya. The International Review of Research in Open and Distance Learning, (3 (3): 185–205.

Pallant, J. 2011. For the SPSS Survival Manual website , go to www.allenandunwin.com/spss This is what readers from around the world say about the SPSS Survival Manual : 359.

Pamuk, S. 2012. Understanding preservice teachers' technology use through TPACK framework. Journal of Computer Assisted learning, 28(5), 425–439.

Pityana, M.B. 2007. History of Distance Education. Inaugural Lecture delivered on the occasion of the launch of the distance course in Bachelor of Business Management, at the Universidad Eduardo Mondlane, Maputo.

Posey, L.A., Bieda, K.N., Mosley, P.L., Fessler, C.J. and Kuechle, V.A. 2019. Mathematical Knowledge for Teaching in Chemistry: Identifying Opportunities To Advance Instruction. In It's Just Math: Research on Students' Understanding of Chemistry and Mathematics (pp. 135-155). American Chemical Society.

Pring, R.. 2000. The focus of educational research–educational practice and policy. Philosophy of educational research. London: Continuum, pp.8-30.

Rajasekar, S., Philominathan, P. & Chinnathambi, V., 2013. Research methodology. [Online], available: https://www.researchgate.net/deref/http%3A%2F%2Farxiv.org%2Fsubmit%2F0821442%2Fpdf. [12 November 2017]

Rehman, A.A. and Alharthi, K., 2016. An introduction to research paradigms. International Journal of Educational Investigations, 3(8), pp.51-59.

Rovai, A.A.P. 2002. A preliminary look at the structural differences of higher education classroom communities in traditional and ALN courses. Journal of Asynchronous Learning Network. 6(1):41–56.

Sauermann, H., & Roach, M. 2013. Increasing web survey response rates in innovation research: An experimental study of static and dynamic contact design features. Research Policy, 42, 1, 273-286.

Scanlon, D. M., Anderson, K. L., & Sweeney, J. M. 2017. Early intervention for reading difficulties: The interactive strategies approach (2nd ed.). New York, NY: Guilford Press.

Schmidt, D.A., Baran, E., Thompson, A.D., Mishra, P., Koehler, M.J. & Shin, T.S. 2009. Technological Pedagogical Content Knowledge (TPACK). Journal of Research on Technology in Education. 42(2):123–149.

Scott, D., & Usher, R. 2011. Researching Education. Continuum International Publishing Group. NY.

Siaciwena R. 2011. Open and Distance Learning in the Southern Africa Development community (SADC). A paper presented at the Regional Open and Distance Learning Awareness workshop held in Johannesburg South Africa

Sikwibele A.L, & Mungoo, J.K. 2009. Distance learning and teacher education in Botswana:

Opportunities and challenges. International Review of Research in Open and Distance Learning, 10 (4): 1–16.

Shah, S.R, & Abdullah, A. 2013. Research Paradigms: Researchers Worldviews, Theoretical Frameworks and Study Designs." Arab World English Journal 4(4): 252–64. [Online], available: http://www.awej.org/index.php?option=com_content&view=article&id=398:sayyed-rashid-shah-abdullah-al-bargi&catid=44&Itemid=133.

Shafer, K.G. 2008. Learning to teach with technology through an apprenticeship model. Contemporary Issues in Technology and Teacher Education. 8:27–44. [Online], Available: http://www.editlib.org/d/26135/article_26135.pdf.

Siemens, G. 2017. Connectivism. *Foundations of Learning and Instructional Design Technology*.

Siemens, G. 2005. Connectivism: A Learning Theory for the Digital Age. Digital Age. 1–8.

Shulman, L. 1986. Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14.

Shulman, L. S. 1987. Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22.

Sogillo, R. R. O., Guimba, W. D., & Alico, J. C. 2016. Assessment of mathematics teachers in a public and a private School: Implications to the quality of teaching secondary mathematics. Advances in Sciences and Humanities, 2(2), 7–16.

Swart, A.J., 2015. Using Web2. 0 technology to improve student academic success among senior engineering students-a case study from a telecommunications module!. In Southern African Telecommunication Networkd and Application Conference (pp. 237-242).

Tang, M, & Byrne, R. 2007. Regular versus online versus blended: A qualitative description of the advantages of the electronic modes and a quantitative evaluation. // International Journal on E-Learning, 6, 2, 257-266

Tejado, I & Pérez, E. 2020. A laboratory for teaching process control: The wastewater treatment plant. The International Journal of Electrical Engineering & Education.

Teo, T. & Zhou, M. 2017. The influence of teachers' conceptions of teaching and learning on their technology acceptance. Interactive Learning Environments. 25(4):513–527.

Terre Blanche, M, Durrheim, K & Painter, D. 2006. Research in practice: Applied methods for the social sciences. Pins.Org.Za. 94–100. [Online], Available: http://pins.org.za/pins35/pins35_bookreview03_Wilbraham.pdf.

Thanh, N. C., & Thanh, T. T. 2015. The Interconnection Between Interpretivist Paradigm and Qualitative methods in Education. American Journal of Educational Science, 1 (2):24-27.

Thorne, S., Sauro, S., & Smith, B. (2015). Technologies, identities, and expressive activity. Annual Review of Applied Linguistics, 35, 215–233.

Tsou, J.Y. 2006. Genetic Epistemology and Piaget's Philosophy of Science: Piaget vs. Kuhn on Scientific Progress. Theory & Psychology. 16(2):203–224.

Tuli, F. 2010. The basic distinction between qualitative and quantitative research in social sciences: Reflection on Ontological, epistemological and methodological Perspectives. Ethiopian Journal of Educational Science, 6 (1): 97-108.

"THE INSTITUTION". 2008. Open Distance Learning Policy. 1–13.

University of South Africa. 2015. "The Institution" Strategic Plan 2016-2030. 1–84.

Valtonen, T., Sointu, E., Kukkonen, J., Mäkitalo, K., Hoang, N., Häkkinen, P., Järvelä, S., Näykki, P., Virtanen, A., Pöntinen, S. and Kostiainen, E. 2019. Examining pre-service teachers' Technological Pedagogical Content Knowledge as evolving knowledge domains: A longitudinal approach. Journal of Computer Assisted Learning, 35(4), pp.491-502.

Venkatesh, V., Rabah, J., Fusaro, M., Couture, A., Varela, W. & Alexander, K. 2016. Factors

Impacting University Instructors' and Students' Perceptions of Course Effectiveness and Technology Integration in the Age of Web 2.0. McGill Journal of Education. 51(1):533–561.

Vygotsky, L. 1978. Interaction between learning and development. In New York: Scientific American Books: In Gauvain & Cole (Eds) Readings on the Development of Children. 34–40. [Online], Available: https://www.colorado.edu/physics/phys4810/phys4810_fa08/.../vygot_chap6.pdf.

Wang, Y., Wang, Y., Stein, D., Liu, Q. and Chen, W. 2019. Examining Chinese beginning online instructors' competencies in teaching online based on the Activity theory. Journal of Computers in Education, 6(3), pp.363-384.

Wang, Q.Y, Zhu, Z.T., Chen, L., and Yan, H.B. 2009. E-learning in China. Campus-Wide Information Systems, 26(2), 77-81.

Webster, J., & Hackley, P. 1997. Teaching effectiveness in technology-mediated distance learning. The Academy of Management Journal, 40,(6), 1282-1309.

Woodley, A., & Simpson, O. 2013. Student dropout–the elephant in the room of distance education. *Online Distance Education: Towalrt a Research Agenda*, 459-483.

Wu, Y. 2013. Research trends in technological pedagogical content knowledge (TPACK) research: A review of empirical studies published in selected journals from 2002 to 2011.

Zhou, Y. & Wei, M. 2018. Strategies in technology-enhanced language learning. Studies in Second Language Learning and Teaching, 8(2), pp.471-495.

APPENDICES

APPENDIX A: SURVEY QUESTIONNAIRE

SECTION 1: DEMOGRAPHIC INFORMATION

Gender

Male	
Female	

Age Range

20 - 29	
30 - 39	
40 - 49	
50 - 59	
60 +	

Work experience

Less than 3yrs	
3yrs – 6yrs	
6yrs – 9yrs	
9rs – 11yrs	
More than 11yrs	

Number of modules taught

1 module	
2 modules	
3 modules	
4 modules	
More than 4 modules	

SECTION 2: QUANTITATIVE SURVEY

For the purpose of this questionnaire, technology refers to digital technology/technologies, such as computers, laptops, iPads or tablets, handhelds, smartphones, interactive whiteboards, software programs, web2.0 tools (podcasts, vodcasts, social networks, blogs, etc.). However, pedagogy refers to teaching strategy or approach one uses to teach. Whereby content refers to the information regarding the module or subject. Please answer all of the questions based on what you are currently doing not based on what you know you should do and if you are uncertain or neutral about your response you may always select "Neither Agree or Disagree."

Strongly Disagree	***Disagree***	**Neither Agree Nor Disagree**	**Agree**	**Strongly Agree**
1	**2**	**3**	**4**	**5**

Technological Knowledge (TK)	**1**	**2**	**3**	**4**	**5**
1. I normally ask other people to assist me to solve technological related problems in my modules.					
2. I usually take time to learn about technology for use within teaching and learning.					
3. I do not understand how to use web2.0 tools such as (podcasts, vodcasts, social networks, blogs) for teaching.					
4. I always do not have time to attend my"The Institution" tools related training.					
5. I rarely play around the technology tools for teaching and learning.					
6. My technological skills are limited regarding teaching and learning.					
Content Knowledge (CK)	**1**	**2**	**3**	**4**	**5**
7. I prefer to give answers to students' questions after more research regarding the module I teach.					
8. I choose to stick to my own ways and strategies of developing understanding of the subject content I teach.					
9. I struggle to make connections between the different topics in the content of the subject I teach.					
10. I rather skip chapters that I do not understand in my module than to make fool of myself in front of students.					
Pedagogical Knowledge (PK)	**1**	**2**	**3**	**4**	**5**
11. I adapt my teaching based upon what students currently understand.					
12. I find it challenging to align learning activities with teaching methods.					
13. I find it difficult to adapt my teaching style to different learners.					
14. I find it time consuming to use wide range of teaching approaches for my students.					
15. I address common student misunderstandings about the subject I teach.					
16. I marvel at other lecturers' curriculum development skills as they easily match content with teaching strategies.					
Pedagogical Content Knowledge (PCK)	**1**	**2**	**3**	**4**	**5**
17. I use several methods to provide multiple representations of content, e.g. analogies, demonstrations, and activities.					

Strongly Disagree	*Disagree*	Neither Agree Nor Disagree	Agree		Strongly Agree		
1	2	3	4		5		
18. I use strategies to adapt content to misunderstandings in my subject area.							
19. There is a relationship between the content and the teaching methods I use for the students.							
20. I need additional methods to adapt material to students' prior knowledge.							
21. I can select effective teaching approaches to guide student thinking and learning in different subjects I teach.							
Technological Pedagogical Knowledge (TPK)			**1**	**2**	**3**	**4**	**5**
22. I show my leadership in helping others to coordinate the use of content, technologies and teaching approaches.							
23. I rather request someone to modify technologies to support student learning.							
24. I always adapt certain technologies to improve my content delivery.							
25. I believe by using technology, my instruction (mode of content delivery) would be more interesting to students.							
26. I think critically about how to use technology effectively in my content delivery.							
27. I select technologies to use to my students that enhance what I teach, how I teach and what students learn.							
Technological Content Knowledge (TCK)			**1**	**2**	**3**	**4**	**5**
28. I choose technologies that enhance the content for a specific lesson.							
29. I believe that properly designed learning activities with technology can promote student's critical thinking.							
30. I know that properly designed learning activities with technology can also enhance students' creativity.							
31. I believe that properly designed learning activities with technology can promote students' active participation.							
32. I use technology to prepare and support my instruction (mode of content delivery).							
33. I know about different technologies that provide diverse representations of the same content.							
34. My subject content knowledge limits the kind of technology that can integrate into the learning environment.							
35. I can effectively integrate the appropriate technology into the content of the subject I am teaching.							
Technology Pedagogy and Content Knowledge (TPACK)			**1**	**2**	**3**	**4**	**5**
36. I teach lessons that appropriately combine technology and teaching approaches.							
37. Integrating educational technologies into student learning is a challenge.							
38. I believe that I am well prepared to manage the educational changes that technology brings in teaching.							

APPENDIX B: RESEARCH PERMISSION

UNISA university of south africa

RESEARCH PERMISSION SUB-COMMITTEE (RPSC) OF THE SENATE RESEARCH, INNOVATION, POSTGRADUATE DEGREES AND COMMERCIALISATION COMMITTEE (SRIPCC)

26 September 2018 (Date of issue)

23 April 2019 (Date of amendment)

Decision: Research Permission Approval from 26 September 2018 until 31 October 2019.

Ref #: 2018_RPSC_049_AR
Dr. Rendani Maladzhi
Student #: N/A
Staff #: 90213998

Principal Investigator:

Dr. Rendani Maladzhi
Department of Mechanical and Industrial Engineering
School of Engineering and Technology
College of Science, Engineering and Technology,
Unisa
maladrw@"The Institution".ac.za, 011 670 9247, 0798864273

Supervisor: Dr. Lydia Mbati, mbatilsa@"The Institution".ac.za, (012) 337 6092, 072 822 8252

Academics' knowledge of technological, pedagogical and content integration at an Open Distance and e-Learning institution

Your application requesting permission to extend the study permission period in respect of the above study has been received and was considered by the Research Permission Subcommittee (RPSC) of the "THE INSTITUTION" Senate, Research, Innovation, Postgraduate Degrees and Commercialisation Committee (SRIPCC) on 29 March 2019.

It is my pleasure to inform you that permission for the study has been granted. You may send primary lecturers (excluding the tutors and markers) at the College of Science, Engineering and Technology, an online survey link through the gatekeeping assistance of "The Institution" ICT.

You are requested to submit a report of the study to the Research Permission Subcommittee (RPSC@"The Institution".ac.za) within 3 months of completion of the study.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

The personal information made available to the researcher(s)/gatekeeper(s) will only be used for the advancement of this research project as indicated and for the purpose as described in this permission letter. The researcher(s)/gatekeeper(s) must take all appropriate precautionary measures to protect the personal information given to him/her/them in good faith and it must not be passed on to third parties. The dissemination of research instruments through the use of electronic mail should strictly be through blind copying, so as to protect the participants' right of privacy. The researcher hereby indemnifies "THE INSTITUTION" from any claim or action arising from or due to the researcher's breach of his/her information protection obligations.

Note:
*The reference number **2018_RPSC_049_AR** should be clearly indicated on all forms of communication with the intended research participants and the Research Permission Subcommittee.*

We would like to wish you well in your research undertaking.

Kind regards,

pp. Dr. Retha Visagie – Deputy Chairperson: RPSC

Email: visagrg@"The Institution".ac.za, Tel: (012) 429-2478

Prof Lessing Labuschagne – Chairperson: RPSC

Email: llabus@"The Institution".ac.za, Tel: (012) 429-6368

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDIX C: ETHICAL CLEARANCE

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2018/06/13

Ref: 2018/06/13/61344958/32/MC
Name: Dr RW Maladzhi
Student: 61344958

Dear Dr Maladzhi

Decision: Ethics Approval from 2018/06/13 to 2021/06/13

Researcher(s): Name: Dr RW Maladzhi
E-mail address: maladrw@unisa.ac.za
Telephone: +27 79 886 4273

Supervisor(s): Name: Dr L Mbati
E-mail address: mbarilsa@unisa.ac.za
Telephone: +27 12 337 6092

Title of research:

Academics' knowledge of technological, pedagogical and content integration at an Open Distance and eLearning institution

Qualification: M. Ed in Open Distance and e-Learning

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2018/06/13 to 2021/06/13.

*The **low risk** application was reviewed by the Ethics Review Committee on 2018/06/13 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date **2021/06/13**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2018/06/13/61344958/32/MC** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Dr M Claassens
CHAIRPERSON: CEDU RERC
mcdtc@netactive.co.za

Prof V McKay
EXECUTIVE DEAN
Mckayvi@unisa.ac.za

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDIX D: COVER LETTER OF AN ONLINE WEB-BASED SURVEY

Dear Prospective participant,

You are invited to participate in a survey conducted by Maladzhi Rendani Wilson under the supervision of Dr L Mbati, a Doctor in the Institute for Open and Distance Learning, College of Graduate Studies towards a MEd at the University of South Africa.

The survey you have received has been designed to study the Academics' knowledge of technological, pedagogical and content integration at an Open, Distance and eLearning institution.

You were selected to participate in this survey because of your academic background. As an academic, you are found to be in the centre of teaching and learning with the assumption that you understand this environment. By completing this survey, you agree that the information you provide may be used for research purposes, including dissemination through peer-reviewed publications and conference proceedings.

It is anticipated that the information we gain from this survey will help us to better understand how much knowledge does academics at "THE COLLEGE" command about technology, pedagogy and content integration in teaching and learning. You are however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally. Consequently, you will not be able to withdraw from the study once you have clicked the send button based on the anonymous nature of the survey. If you choose to participate in this survey it will take you not more than 25 minutes of your time.

You will not benefit from your participation as an individual, however, it is envisioned that the findings of the study may benefit all academics within the college and as well as the entire "The Institution" community. We do not foresee that you will experience any negative consequences by completing the survey because you can do it at your own comfortable space.

The researcher(s) undertake to keep any information provided herein confidential, not to let it out of our possession and to report on the findings from the perspective of the participating group and not from the perspective of an individual.

The records will be kept for five years for audit purposes where after it will be permanently destroyed. Hard copies will be shredded and electronic versions will be permanently deleted from the hard drive of the computer. You will not be reimbursed or receive any incentives for your participation in the survey.

The research was reviewed and approved by the CEDU. The primary researcher, Rendani Wilson Maladzhi, can be contacted during office hours at 011 670 9247 and e-mail: maladrw@"The Institution".ac.za. The study leader, Doctor L Mbati, can be contacted during office hours at 012 337 6092 Institute for Open and Distance Learning College of Graduate Studies "THE INSTITUTION", e-mail: mbatilsa@"The Institution".ac.za.

Should you have any questions regarding the ethical aspects of the study, you can contact the chairperson of the CEDU REC Chairperson: Dr M Claassens (mcdtc@netactive.co.za). Alternatively, you can report any serious unethical behaviour at the University's Toll Free Hotline 0800 86 96 93.

You are deciding whether to participate by continuing to the next page. You are free to withdraw from the study at any time prior to clicking the send button.

APPENDIX E: CONSENT/ASSENT TO PARTICIPATE IN THIS STUDY

Dear "The Institution" Colleague,

I am a Senior Lecturer in "THE COLLEGE" and I am conducting a survey on **Academics' knowledge of technological, pedagogical and content integration at an Open, Distance and eLearning institution** as partial fulfilment of my MEd qualification.

I have received permission to conduct this research survey from College of Education Research Ethics Committee (2018/06/13/61344958/32/MC) and the Research Permission Subcommittee (2018_RPSC_049_AR).

You are hereby invited to participate in this online survey. I request that you please complete this survey on or before 30 April 2019. Most of the questions are closed questions and you only need to select the most appropriate answer.

You are however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally. Consequently, you will not be able to withdraw from the study once you have clicked the send button based on the anonymous nature of the survey. If you choose to participate in this survey it will take you not more than 25 minutes of your time.

I would like to emphasize that all your responses will be combined with feedback from several other respondents and will therefore be de-personalized and kept confidential. Should you have any queries, concerns or suggestions or if you wish to receive feedback at the end of the study, please contact me

Dr Maladzhi, via email: maladrw@"The Institution".ac.za

Or my supervisor Dr Mbati, via email: mbatilsa@"The Institution".ac.za

*1. I have read the cover letter and hereby consent to participate in the survey:

- [ ] Accept
- [ ] Decline

APPENDIX F: TPACK CODED STATEMENT

NO.	STATEMENT	CODE
	TK	
1	I normally ask other people to assist me to solve technological related problems in my modules.	TK1
2	I usually take time to learn about technology for use within teaching and learning.	TK2
3	I have never used web2.0 tools (podcasts, vodcasts, social networks, and blogs) for teaching and learning.	TK3
4	I do not have time to attend my “The Institution” tools related to training.	TK4
5	I rarely play around the technology tools for teaching and learning.	TK5
6	My technological skills are limited regarding teaching and learning.	TK6
	CK	
7	I prefer to give answers to students’ questions after more research regarding the module I teach.	CK1
8	I choose to stick to my own ways and strategies of developing understanding of the subject content of that I teach.	CK2
9	I struggle to make connections between the different topics in the content of the subject I teach.	CK3
10	I rather skip chapters that I do not understand in my module than to make fool of myself to students.	CK4
	PK	
11	I adapt my teaching based upon what students currently understand.	PK1
12	I find it challenging to align learning activities with teaching methods.	PK2
13	I find it difficult to adapt my teaching style to different learners.	PK3
14	I find it time consuming to use wide range of teaching approaches for my students.	PK4
15	I address common student misunderstandings about the subject I am teaching.	PK5
16	I marvel at other lecturers' curriculum development skills as they easily match content with teaching strategies.	PK6
	PCK	
17	I use several methods to provide multiple representations of content, e.g. analogies, demonstrations, and activities.	PCK1
18	I use strategies to adapt content to my understanding in my subject area.	PCK2
19	There is a relationship between the content and the teaching methods I use for the students.	PCK3
20	I need additional methods to adapt material to students’ prior knowledge.	PCK4
21	I can select effective teaching approaches to guide student thinking and learning in different subjects I teach.	PCK5

NO.	STATEMENT	CODE
TPK1		
22	I show my leadership skills by helping others to coordinate the use of content, technologies, and teaching approaches.	TPK1
23	I rather request someone to modify technologies to support student learning.	TPK2
24	I always adapt certain technologies to improve my content delivery.	TPK3
25	I believe by using technology, my instruction (mode of content delivery) would be more interesting to students.	TPK4
26	I think critically about how to use technology effectively in my content delivery.	TPK5
27	I select technologies to use to my students that enhance what I teach, how I teach and what students learn.	TPK6
TCK		
28	I choose technologies that enhance the content for a specific lesson.	TCK1
29	I believe that properly designed learning activities with technology can promote student's critical thinking.	TCK2
30	I know that properly designed learning activities with technology can also enhance students' creativity.	TCK3
31	I know about different technologies that provide different representations of the same content.	TCK4
32	My curriculum content knowledge limits the kind of technology that can be integrated into the learning environment.	TCK5
33	I can effectively integrate the appropriate technology into the content of the subject I am teaching.	TCK6
34	I believe that properly designed learning activities with technology can also enhance students' creativity	TCK7
35	I believe that properly designed learning activities with technology can promote students' active participation.	TCK8
TPACK		
36	I teach lessons that appropriately combine technology and teaching approaches.	TPACK1
37	I believe that I am well prepared to manage the educational changes that technology brings in teaching.	TPACK2
38	Integrating educational technologies into student learning is a challenge.	TPACK3

APPENDIX G: DESCRIPTIVE STATISTICS

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
TK1	123.57	280.846	.296	.590	.810
TK2	123.16	293.170	.047	.503	.819
TK3	123.67	281.143	.261	.755	.812
TK4	123.87	290.478	.093	.728	.818
TK5	123.80	279.705	.335	.736	.809
TK6	123.98	276.712	.390	.762	.807
CK1	123.11	281.205	.336	.471	.809
CK2	123.37	288.145	.164	.564	.815
CK3	124.47	281.217	.292	.815	.811
CK4	124.58	280.568	.296	.865	.810
PK1	123.00	279.908	.385	.677	.808
PK2	124.10	283.196	.271	.792	.811
PK3	124.12	279.007	.362	.800	.808
PK4	123.39	286.516	.186	.541	.814
PK5	122.82	285.254	.223	.546	.813
PK6	123.61	274.263	.456	.715	.805
PCK1	123.06	296.997	-.036	.851	.821
PCK2	123.20	293.682	.041	.879	.818
PCK3	122.66	276.618	.547	.766	.804
PCK4	123.02	272.390	.627	.762	.801
PCK5	122.98	296.045	-.011	.825	.820
TPK1	122.92	276.028	.511	.798	.804
TPK2	123.72	287.608	.164	.755	.815
TPK3	123.17	280.235	.343	.746	.809
TPK4	122.55	273.791	.596	.678	.802
TPK5	122.73	277.350	.507	.796	.805
TPK6	123.01	283.207	.305	.859	.810
TCK1	123.08	282.672	.318	.841	.810
TCK2	122.37	277.708	.602	.847	.804
TCK3	122.32	275.967	.631	.910	.802
TCK4	122.72	278.160	.534	.829	.805
TCK5	123.92	280.994	.312	.474	.810
TCK6	123.02	297.425	-.045	.834	.821
TCK7	122.32	275.507	.655	.855	.802
TCK8	122.37	276.743	.557	.824	.804
TPACK1	123.19	296.296	-.015	.763	.820
TPACK2	123.18	303.185	-.168	.825	.826
TPACK3	123.31	277.824	.409	.644	.807