Utilizing a Social Constructivist approach to cultivate Teacher-educators' and trainees' Digital competence at Makerere University

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April, 2021

DECLARATION

I David Kakeeto, declare that this research report entitled, "***Utilizing a Social Constructivism approach to cultivate Teacher-educators' and trainees' digital competence in teaching at Makerere University***" is my original work and to the best of my knowledge has not been submitted to any other university for the award of a degree.

Signed: 

David Kakeeto (Researcher)

Date: 19/4/2021

APPROVAL

This is to ascertain that this research report entitled, "***Utilizing a Social Constructivism approach to cultivate Teacher-educators' and trainees' digital competence in teaching at Makerere University***" has been developed under my supervision.

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COPYRIGHT STATEMENT

DEDICATION

I dedicate this piece of work to my parents Mr. Edward Lusiba and Mrs Teddy Nabukenya Lusiba.

ACKNOWLEDGEMENT

In the first place, I thank The Almighty God, it has been indeed His providence which has enabled me accomplish this journey of academic excellence. I want to highly acknowledge people who have been so instrumental in the completion of my PhD studies. My supervisors: Professor Anthony Muwagga Mugagga and Associate Professor Ronald Bisaso for their excellent academic support which has given me this milestone in the world of academia. I want to thank in a very special way the teacher trainers and trainees in the School of Education, Makerere University most especially those who sacrificed their time and worked with me in this study to add value to the struggle of improving ICT integration in teaching and learning. I want to thank most sincerely the Dean, School of Education, Assoc. Prof. Betty Ezati for the assistance she rendered me when I was totally troubled with the admissions process and delays; I want also to extend my sincere appreciation to friends in the academia who shared with me about my work most especially; Assoc. Professor Mulumba M. B, Dr. David Kabugo, Dr. Rovincer Najjuma, Dr. Rebecca Nambi and Dr. Mary Kakeeto, Dr. Michael Walimbwa, Mr. Teresphorous Kakinda, Dr. Branco Ssekalegga, Mr. Collins Kalule, Dr. Shopi Mbulankende, and Dr. Charles Kyasanku. I extend strong thanks to my family most especially my wife, Josephine Najjemba Kakeeto, my children; Maria Angella Nabasinga, Nalugemwa Proscovia, Joseph Andrew Waliggo and David Adrian Mayiga for their great love. I thank my special and indeed great friends with whom I have shared my PhD dream journey; Mr. Deusdedit Kiwanuka, Mr. John Kiberu, Ms. Rukia Nakintu, Ms Betty Muteza and Mr. Andrew Ssegawa. I cannot forget my senior mentor Professor J.C Ssekamwa for his endless guidance.

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LIST OF ABBREVIATION

ICT: Information and Communication Technology

SSA: Sub Saharan Africa

CEES: College of Education and External Studies

DEEWR: Department of Education, Employment and Workplace Relations

IICD: International Institute for Communication and Development

LMS: Learning Management System

HE: Higher Education

MOICT: Ministry of Information and Communication Technology

NORAD: Norwegian Agency for Development Cooperation

PHEA: Partnership for Higher Education in Africa

MUELE: Makerere University Electronic Learning Environment

MoEST: Ministry of Education, Science and Technology

UTAUT: Unified Theory of Acceptance and Use of Technology

UCE: Uganda Certificate of Education

UACE: Uganda Advanced Certificate of Education

ZPD: Zone of Proximal Development

NAPE: National Assessment of Progress in Education

TPACK: Technology Pedagogy and Content Knowledge

DVD: Digital Versatile Disc

ODeL: open, distance and e-learning

MP3: (MPEG): Moving Picture Experts Group-Layer 3

UNESCO: The United Nations Educational, Scientific and Cultural Organization

DICTS: Directorate of Information and Communication Technologies

ELT: Experiential Learning Theory

AR: Action research

HR: Human Resource

FGD: Focus Group Discussion

ABSTRACT

The study aimed at establishing how the social constructivist approach can be adopted to develop teacher educators' and trainees' digital competence at Makerere University, School of Education. The study answered the following questions namely: what particular technology knowledge can be acquired by the teacher-educators and teacher trainees from the social processes; what particular technology skills can be acquired by the teacher-educators and teacher trainees from the social processes and lastly, how do cultural processes influence teacher-educators' technology knowledge and skills? The study adopted Kurt Lewin's interpretive action research design with three phases of action model namely: unfreezing, changing and refreezing. The study also used social processes as an intervention. The study was guided by the constructivism theory taking Vygotsky's social constructivism philosophy. The study population was composed of teacher trainers and trainees. The study sample comprised of 35 participants and these were selected using; stratified purposive and convenient sampling techniques. The study revealed that: social processes can nurture teacher educators' and trainees' technology knowledge in form of; content analysis, research knowledge, civic literacy, media Literacy, distributed cognition, collective intelligence, judgment, negotiation and photo-visual literacy; again, results revealed that: social processes can also nurture teacher educators' and trainees' technology skills in form of; information presentation, networking, data management, Internet, communication, self-direction, appropriation, creativity, collaborative, problem solving, critical thinking, information literacy and multitasking; results further showed that; cultural processes such as; teacher trainers' beliefs, attitude, perceptions, disciplinary background, ICT background knowledge, curriculum design plus policy guidelines greatly influence teacher educators' technology knowledge and skills. It was concluded that; team work is a basic technique for nurturing teacher educators' and trainees' technology knowledge; technology skills require continuous active practice and they cannot be attained in isolation of technology knowledge; individual and institutional cultural values are very fundamental in influencing teacher educators' technology knowledge and skills. It was recommended that; teacher trainers and trainees should engage in team teaching and learning as a way of sharing ICT integration knowledge; teacher trainers should make teaching and learning action-based, The Dean and Heads of Department, School of Education should develop an evaluative instrument to regularly assess the extent to which their academic staff are using the available technologies to facilitate teaching and learning; The budgetary committee for The School of Education should annually include funds to facilitate ICT integration in teaching and learning.

CHAPTER ONE

INTRODUCTION

Introduction

In spite the seemingly great expansion in Information and Communication Technology (ICT) usage, many Higher Institutions of Learning in Sub Saharan Africa (SSA) are still facing a lot of challenges both in access and effective pedagogical utilization of ICT. Salient among the major causes of this, its alleged is a constrained ICT environment for most teacher education higher institutions of learning (Guma, Faruque, & Khushi, 2013). The most critical factor in the successful integration of ICTs into teacher education is the extent to which the teacher educators have the knowledge and skills for using them in teaching. So, teacher training requires a shift in teachers' roles, understanding the learning process and a transition from traditional teaching style to a social-constructivist approach (Postholm, 2006). This study using Makerere University and School of Education in particular, pivoted on Utilizing a Social Constructivist approach to cultivate Teacher-educators' and trainees' digital competence to harness the pedagogical novelty in ICT.

Development of Higher education in Africa

According to Tadesse & Martin (2013), the practices of education were there in pre-colonial settings of Africa. Scholars in African higher education like Ajayi et al (1996), Assie-Lumumba (2006), and Lulat (2005), extensively documented the genesis of African higher education tracing back to the pyramids of Egypt, the obelisks of Ethiopia, and the Kingdom of Timbuktu. Among the few higher education institutions established before world war one were: Fourah Bay College in Freetown, Sierra Leone that was established in 1827 by the Church Missionary Society (CMS) of London as an institution for training African clergymen and schoolmasters; but then University of Cape Town (1829) and Stellenbosch University (1866) of South Africa, University of

Khartoum (1902), Cairo University (1908), University of Algeria (1909), were also established in consecutive years. After WWI more higher education institutions were established in Africa including Makerere University (1922) of Uganda, Egerton University (1939) of Kenya, University of Ghana (1948), University of Ibadan (1948) of Niagara, Addis Ababa University (1950) of Ethiopia and University of Zimbabwe (1952) came into existence (Damtew, 2003). However, the main purpose for colonial higher education in Africa was basically to produce the -elite required for colonial administration (Ashby, 1961).

Historical Evolution of ICT in higher education pedagogy

In the first place, the study is contextualized in Higher Education (HE). Higher Education refers to tertiary education leading to award of an academic degree or diploma in a specific field. Higher Education, also called post-secondary education, third-level or tertiary education, is the final stage of formal learning that occurs after completion of secondary education. Higher Education in Uganda started way back in 1921 when the colonial government built a Technical College on Makerere Hill; it was named Kampala Technical College. The College was inaugurated in 1922 and renamed Makerere College. Another small institution named Kampala Technical School was also set up on the same hill to handle technical subjects (Lugumba and Ssekamwa, 1973). However, Higher Education in Uganda is regarded as an optional additional level of learning for either learners who perform exceptionally well and are admitted on government scheme or learners who perform well, but do not meet the requirements for government scheme but can finance their education through the private scheme programme in both public and private institutions of higher learning. Makerere University as the oldest Higher Institution of learning in the Country has numerous courses and among which is teacher education that is housed in the College of Education and External Studies. Teacher education globally has been delivered through different approaches such as teacher centered (purely face to face) whereas

in some cases through learner centeredness by using information and communications technology, adopting a blended teaching-learning approach.

Integration of Information and communication technology in teaching has been adopted by many institutions of higher education and in many cases proved to be very positive although so challenging. According to Ely (1996), information technology training for teachers started way back in 1920s in form of a single and separate course. In the late 1960s there was a move in America to integrate technology skills in various components of teacher education programs. But the use of technology was basically to help teachers gain ICT knowledge and skills not until the early 1990s when the constructivist pedagogical theory was increasingly taught in colleges of education in America linking information technology and teaching. During the mid-nineties, applications which used hypertext, interactive whiteboards, multimedia blackboards and internet access to build cognitivist and constructivist learning environments were developed (Jimoyiannis, 2012; Scardemelia & Bereiter, 1991). However, these applications were initially found to be ineffective to better learning outcomes as compared to traditional pedagogies. This finding, however, might have been largely influenced by teachers' and learners' lack of familiarity with ICTs at the time (White, 2005).

Ely (1996) reported that, by 1995 about two percent of public schools in the United States had videotape recorders aimed at improving teaching. This showed some improvements in accessing public broadcasting services, although it did not indicate how much academic improvements it contributed. Again between 1994-1995 computer networking and the growth of the World Wide Web generated a lot of attention in education (Ely, 1996). In 1996, the use of CD-ROMs became famous to promote educational technology in homes, schools and community settings. Despite these initiatives, the implementation of ICTs in teacher education has remained a global challenge. However, several researchers have looked at ICTs in teaching and learning from two broader perspectives: pedagogical values of ICT and ICT integration factors:

Pedagogical values of information and communication technology

Information and Communication Technology (ICT) expands access to education and through ICT, learning can occur anytime and anywhere. Online course materials, for example, can be accessible 24 hours a day. Teleconferencing classrooms allow both learners and lecturers to interact simultaneously. Multiple resources are abundant on the Internet, and knowledge can be acquired through video clips, audio sounds, and visual presentation and so on. Further, research has revealed that ICT supports learner-centered environment (Castro and Alemán, 2011). ICT promotes "democratic learning communities" (Woolfolk, 2007) commonly known as, collaborative learning (Forcheri and Molfino, 2000). Nicaise and Crane (1999) in Ng'ambi & Johnston (2006) emphasized that**,** when lecturers use ICT to facilitate teaching, it increases students' critical thinking. Couceiro et al., (2013) also found out that ICTs such as Web 2.0 tools (blogs, Vokis, wikis) increase students' engagement and motivation and thus results into: co-creation and exchange of knowledge; ICTs also support personal learning environments (Thompson, 2011).

Knowing how to critically use digital technologies supports social interaction and education (Aesaert & van Braak, 2015). Digital competence is highly relevant in empowering a learner to become engaged citizen (Pangrazio, 2014). Digital competence allows both teachers and students to improve the ways of teaching and learning in new learning fashions, extends the ability and skills of applying their teaching and learning in real situation, allows learners to work in groups for cooperative and collaborative learning, helps in developing self-learning habits (learning at own pace), allows learners to learn with the teacher rather by the teacher, develops inquiry-learning habits, allows learners to use the right information at right time to achieve right objective, it also allows learners exchange learning experiences and information with other students and teachers living anywhere in the world, it facilitates active participation.

This entire argument is in light with Conner's informal learning scheme (2004), who suggests that most learning happens through processes not structured or sponsored by an employer or a school. When students get engaged in personal online interactions, informal learning takes place. This sort of learning is very critical to life in such a way that, learners get motivated to learn how to; think, associate, work with technology sometimes individually or with support from colleagues in the most suitable way. Teacher trainers need to be aware that learning happens very well in an informal setting, and one best option to encourage this is to take advantage of informal learning scheme, where we encourage students adopt to social media platforms for their academic work in a simple and friendly way. This can happen when teacher trainers also get involved in collaborative activities with students. Informal learning promotes lifelong process through which people acquire attitudes, values, skills, and knowledge mainly from social media, from daily experiences, from various kind of interactions, in general. It is apparent that informal learning is rather related to incidental learning. This means that social learning or collaborative learning in the process promotes digital competence since the learners must adopt a certain online platform such as Face Book, WhatsApp, Google classroom, blackboard and also use a certain information technology device such as a computer or mobile phones to support learning process.

Information and Communication Technology integration in Education

Information and communication technologies (ICT) have become one of the fundamental building blocks of modern society. Today, it has become a global concern where educational systems are adopting new technologies to integrate ICT in the teaching and learning process with an aim of preparing students with the knowledge and skills they need in their subject matter. In this regard, teaching is evolving from teacher-centered to student-centered learning environments. ICTs facilitate not only the delivery of lectures but also the learning process itself. So, ICT integration includes computer based technologies, digital imaging, the internet, file servers, data

storage devices, network infrastructure, desktops, laptops, smart phones and other instructional technology tools.

Allen (1997) indicated that, the basic skills of the future are the use of powerful technologies like computers. The traditional textbook can no longer fulfill the need in the rapid changing and the information-explosion world. He asserted that the traditional teacher-centered approach makes classroom no longer an effective system to prepare students for the realities which they face in the near future. To Rosener (1997), ICT is much better than, traditional method of teaching and learning as it being limitless of time and space. That the teachers and students can study from anywhere, any time. And Poole (1998) pointed out that suitably integrated computer use can contribute to successful results in the classroom as to: support teaching and learning, support learner's socialization process. Whereas, according to Kennewell et al. (2000), integration of ICT in teaching requires understanding at a deeper level to facilitate the development of strategies and process to identify opportunities, solve problems and evaluate solution (https://www.ukessays.com/).

Much as there are global investments in educational technology; Nut (2010), little has been attained in terms of improving teaching and learning in SSA (Gallaher, 2007). Several surveys have been carried out to establish factors that relate to the use of ICT in teaching and learning which include: lack of teacher confidence (Bosley & Moon, 2003; Fabry & Higgs, 1997; Larner & Timberlake, 1995); resistant to change and negative attitude (Mumtaz, 2000; Snoeyink & Ertmer, 2001); lack of time (Cuban, 1999; Ebersole and Vorndam, 2002; Preston, Cox, & Cox, 2000); lack of training (Kirkwood, Van Der Kuyl, Parton, & Grant, 2000; Veen, 1993; Wild, 1996); lack of access to computing resources (Bosley and Moon, 2003; Fabry and Higgs, 1997; Pelgrum, 2001); lack of institutional support (Butler and Sellbom, 2002; Snoeyink and Ertmer, 2001); and many more. However, these barriers have a substantial variation between teachers across countries (Pelgrum, 2001).

Development of ICTs in Education in Sub Saharan African universities

Many universities in Sub Saharan Africa and more especially in South Africa have greatly embraced the role of ICT in promoting learning. According to OER Africa (2014), the University of Pretoria was among the first universities to take up eLearning in 1998. At the University of South Africa, the instructors use eLearning to distribute resources and facilitate interaction and use mobile technology for learners' communication. The University of Cape Town initially used WebCT and Moodle. Since 2010, the University of Kwazulu Natal has also been using the Moodle platform for teaching and learning (Sibanda & Donnelly, 2014). At Tshwane University of Technology, 'electronic campus' was the initial LMS in 2011, but it was later replaced by Blackboard (MyTutor). At the University of Stellenbosch and Cape Peninsula University of Technology, a proprietary LMS WebCT was adopted for learning (Mlitwa, 2006). Nyandiere, Kamuzora, Lukandu & Omwenga (2012) reported that, higher educational institutions in Kenya also adopted ICT in teaching and more user improvements are being made. In Uganda, many universities have attempted deploying ICTs in teaching although their success has been limited due to several factors. At Kyambogo University for example, there have been initiatives to produce ICT-based Educational Content with support from the International Institute for Communication and Development (IICD) and The Ministry of Education and Sports, however not all stakeholders have embraced this as yet. Such initiatives have helped improve the quality of teaching at HEIs in Africa (Kisambira, 2007).

Paradigm shift

Education around the world is experiencing major paradigm shifts in educational practices of teaching and learning under the umbrella of ICT enabled learning environment. Whereas learning through facts, drill and practices, rules and procedures was more adaptive in earlier days, learning through projects and problems, inquiry and design, discovery and invention, creativity and diversity, action and reflection is perhaps more fitting for the present times. The major

hallmark of this learning transition is from teacher centered (traditional) to learner focus (constructivist paradigm). The distinction between learner- and teacher-centered pedagogy is often made with reference to the distribution of expertise and authority in the classroom. During the last three decades, the changes in educational environment have been phenomenal. Shifting the emphasis from teaching to learning can create a more interactive and engaging learning environment for teachers and learners. This new environment also involves a change in roles of both teachers and learners. The role of the teachers will change from knowledge transmitter to that of facilitator, knowledge navigator and sometime as co-learner. The new role of teachers demands a new way of thinking and understanding of the new vision of learning process. Learners will have more responsibilities of their own learning as they seek out, find, synthesize, and share their knowledge with others. ICT provides powerful tools to support the shift from teacher-centered to learner-centered paradigm and new roles of teacher, learner, curricula, and new media.

According to Majumdar, S (2006), shifting the emphasis from teaching to learning can create a more interactive and engaging learning environment for teachers and learners. This new environment also involves a change in roles of both teachers and learners. The role of the teachers will change from knowledge transmitter to that of facilitator, knowledge navigator and sometime as co-learner. The new role of teachers demands a new way of thinking and understanding of the new vision of learning process. Learners will have more responsibilities of their own learning as they seek out, find, synthesize, and share their knowledge with others. ICT provides powerful tools to support the shift from teacher-centered to learner-centered paradigm and the new roles of teacher, learner, curricula, and new media. The major shifts have been described as below:

Table 1.1: Paradigm shift: from teacher-centered to learner-centered paradigm

Changes in teachers' roles	
Teacher-centered (traditional)	**Learner-centered (constructivist paradigm)**
Transmitter of knowledge	Guide and facilitator of knowledge
Controller of learning	Creator of learning environment
Always expert	Collaborator and co-learner
Expository	Interactive/experiential
Changes in learners' roles	
Passive learner	Active learner
Reproducer of knowledge	Producer of knowledge
Dependant learner	Autonomous learner
Solitary learner	Collaborative learner
Solely learning content	Learning to learn/creative
Changes in the curriculum design and delivery	
Memorizing facts	Inquiry-based
Artificial teaching exercises	Authentic learning
Rigid/ fixed time space	Open/ flexible-anytime/ anywhere
Single path progression	Multi path progression
Changes in media applications	
Single sense stimulation	Multi sensory stimulation
Single media application	Multimedia application
Delivery of information	Exchange of information
Monologue communication	Digital communication

Paradigm shift requires acquisition of new knowledge and skills of the modern technology tools used in the delivering the new curriculum. These new changes taking place in learning and teaching demand a new teaching and learning approach more especially by ICT integration, because there is no doubt that ICT has the potential to transform the nature of education, and it facilitates the emergence of responsible knowledge society by emphasizing lifelong learning with meaningful and enjoyable learning experiences.

Learner-centered pedagogy

Education experts assert that learner-centered teaching is where the student assumes the responsibility for learning while the instructor is responsible for facilitating the learning. Learner-centered approach boosts creativity and innovation. It is also noted that, under the teacher–centered approach some students may lack the confidence to ask teachers some concepts that were not clearly explained, but during interactions with fellow students and perhaps if there is collaboration amongst themselves and their teacher, it is much easier to share or ask questions from the major areas of concern. According to Mascolo (2009) advocates of student-centered pedagogy generally proceed from the constructivist position that maintains that learners construct their understandings through their actions and experiences on the world. Student-centered thinking has spawned a burgeoning interest in the use of a variety of different active learning methods in and out of the classroom. These include collaborative learning, experiential learning, problem-based learning, and a variety of other pedagogical methods. However, the theory and practice of student-centered pedagogy is not without its problems. Student centered learning is often defined in contradistinction to teacher-centered pedagogy. The idea that students must be active in the construction of knowledge is often understood to imply a diminishing role for the teacher in the learning process.

The strength of learner-centered pedagogy

Hancock, Bray and Nason (2003) describe learner-centered pedagogy as follows:(a) teachers are a catalyst or helper to students who establish and enforce their own rules; (b) teachers respond to student work through neutral feedback and encourage students to provide alternative/additional responses, (c) teachers ask mostly divergent questions and few recall questions, (d) students are allowed to select the learning task and the manner and order in which it is completed, (e) students are presented with examples of the content to be learned and are encouraged to identify the rule of behaviour embedded in the content (f) Students are encouraged

to summarize and review important lesson objectives throughout the lesson and the conclusion of the activity; (g) students are encouraged to choose new activities in the session and select different topics for study, and (h) students signal their readiness for transition to the next learning set (pp. 366-367).

Proper pedagogy usually promotes social interactions even when it does not engage technology (Barker, 1994). One of the leading learning theories which supports social interactions is the Social Constructivism (Howell, 2012). Social constructivism theory looks at learning as a process where learners generate knowledge through interactions with peers and their teachers acting as facilitators (Powell & Kalina, 2009). Basically, Social Constructivism is a theory about how people socially construct knowledge (Howell, 2012).

The Constructivist learning approach

The study was based on the theoretical underpinning that knowledge is constructed actively by learners within a socio-cultural context. I used social constructivism theory advanced by Lev Vygotsky in 1978 which postulates that, each individual mentally constructs the world of experience through cognitive processes based on specific assumptions about reality, knowledge, and learning. So, the study was based on the constructivists' point of view that learners are active participants in the knowledge creation process, but not passive recipients, and so collaborative activities of teaching and learning were the major baseline of the study.

Constructivism theory can be traced far back from famous philosophers such as: Fosnot, 1996, Kant (1946), whose philosophy stresses subjectivism and relativism, implying that, reality may exist separate from experience, it can only be known through experience, resulting in a personally unique reality. According to Glasersfeld (1984, 1990) there are four major epistemological tenets of constructivism and these include:

1. Knowledge is not passively accumulated, but rather, is the result of active cognizing by the individual.

2. Cognition is an adaptive process that functions to make an individual's behavior more viable given a particular environment.
3. Cognition organizes and makes sense of one's experience, and is not a process to render an accurate representation of reality; and
4. Knowing has roots in biological/neurological construction, social, cultural, and language-based interactions. In the essence of understanding this study, emphasis on the social science perspective and not natural sciences, it concentrated more on social and cultural elements and not being a linguistic study, the language component was also ignored.

However, there are three major schools of thought in the constructivist theory of education: cognitive, radical, and social constructivism. Along the same line, it should be understood clearly from the beginning that, Bruner (1966) and Piaget (1972) are considered the chief theorists among the cognitive constructivists, whereas Von Glasersfeld is for radical constructivism while Vygotsky (1978) is the major theorist among the social constructivists. According to the constructivist's view of learning, individuals create their own understanding of the world through various life experiences and internalizing these experiences. In this constructivism approach, the teachers' main role is to direct learners so that they construct ideas and not reproduce mere facts. The teacher should guide the learners to realize that the activities they are undertaking are helping them arrive at a better understanding of their problems. By looking at the tasks given critically and using their chosen strategies, students become expert learners as they learn how to learn on their own. The learners look for information on their own and practice what they have learnt using ICT resources. The learners are able to manipulate the ICT resources and in doing this practically they do not easily forget what they learn, since the process is action oriented.

According to Gergen (1995), the philosophy of this theory maintains that people construct knowledge but do not acquire it from anyone. So, the theory looks at learning as an active process where information is presented to the learner in a form which facilitates the freedom to make

personal interpretations and thus meaning making. And the presentation of information can be in a number of forms, for example, the teacher may present: texts or words, images, audio, video, or even just principles and rules to guide the learner. Constructivists believe that, people develop knowledge individually in social learning environments by constructing their own schema based on the information presented to them. Constructivism appreciates the fact that learners are not empty headed, but rather they are active constructors of personal knowledge.

The instructor and student should engage in an active dialog (Socratic learning). The task of the instructor is to translate information to be learned into a format appropriate to the learner's current state of understanding. Curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned. Learning is considered a process where the learner is the engine of the learning activity; the teacher is a facilitator of knowledge, which means learners cannot learn unless they are active participants in the knowledge construction process.

According to Ozgur (2004), constructivism is an approach in education that claims humans are better able to understand the information they have constructed by themselves. According to constructivist theories, learning is a social advancement that involves language, real world situations, and interaction and collaboration among learners. The learners are considered to be central in the learning process. Learning is affected by our prejudices, experiences, the time in which we live, and both physical and mental maturity. When motivated, the learner exercises his will, determination, and action to gather selective information, convert it, formulate hypotheses, test these suppositions via applications, interactions, or experiences, and to draw verifiable conclusions. Constructivism transforms today's classrooms into a knowledge-construction site where information is absorbed, and knowledge is built by the learner. The learner is an active participant, physically involved in knowledge generation; understanding is a result of participation in the learning process.

In constructivist classrooms, unlike the conventional environment, the teacher is a facilitator and a guide, who plans, organizes, guides, and provides directions to the learner, who is accountable for his/her own learning. The teacher supports the learner by means of suggestions that arise out of ordinary activities, by challenges that inspire creativity, and with projects that allow for independent thinking and new ways of learning information. Students work in groups to approach problems and challenges in real world situations, this in turn leads to the creation of practical solutions and a diverse variety of student products. Constructivist theories have found more popularity with the advent of personal computers in classrooms and use of internet for collaboration purposes. Computers provide individual students with tools to experiment and build their own learning at their own pace, individualized learning. While with the use of the web, the learner can now conduct research, interact with diverse populations, share ideas, and work on group projects.

Constructivist classrooms, unlike the conventional environment, the teacher is a facilitator and a guide, who plans, organizes, guides, and provides directions to the learner, who is accountable for his own learning. The teacher supports the learner by means of suggestions that arise out of ordinary activities, by challenges that inspire creativity, and with projects that allow for independent thinking and new ways of learning information. For computer-mediated materials, locus of control is usually given to the learner to decide on the navigational approaches, i.e., when to move forward, back, repeat or exit a given session. Students work in groups to approach problems and challenges in real world situations, this in turn leads to the creation of practical solutions and a diverse variety of student products. Constructivist theories have found more popularity with the advent of personal computers in classrooms and homes. Computers provide individual students with tools to experiment and build their own learning at their own pace. With the use of the web, the learner can now conduct research, interact with diverse populations, share ideas, and work on group projects. The assessment tool in a constructivist classroom is not a test or

a quiz, rather it is the learner product; most of the time this is in a portfolio format that has been designed by the learner.

The constructivist approach promotes higher level thinking skills. Subran (2013) confirmed that the use of ICT promotes efficiency of higher order thinking skills which are a constructivist attribute in teaching and learning. Adoption of innovative modes such as active learning or problem-based learning which are well facilitated by using ICT is today being encouraged in order to promote the development of communication, problem-solving and self-directed learning skills. Razak and Lee (2012) examined the impact of a technological application, Wiki on the promotion of higher order thinking within the teaching and learning of literary text. The study findings concluded that Wiki indeed is an effective pedagogical tool that which includes step-by-step guidance from the teacher during the peer collaboration process. Any learning and teaching that involves learner-centeredness is a constructivist-based approach which is a fundamental system of the 21st Century learning. Technologies like: Web 2.0 which facilitates collaborative learning enhances higher order thinking skills. Web 2.0 applications can be seen as 'intellectual partners' in the collaborative learning process to promote critical and higher-level thinking. For example, by use of graphics, photos, animation and videos, learners can design and complete creative, higher-level tasks.

Using constructivist pedagogy to support the use of technology encourages learners and teachers to concentrate on how to think and understand rather than memorizing parts of the knowledge. This kind of process supports active learning, where learners are fully participating in the learning activities such as doing projects in groups. In a constructivist classroom, students construct their knowledge. Online technologies can be used to gather, communicate, and construct knowledge by pupils according to their needs and what they already know. Constructivism suggests that learning should be built upon the prior knowledge of students. All the students will have different starting points from which to acquire new knowledge. Customizing activities to every

single student may not be achievable as it requires time and staffing. It must be noted however that, constructivism theory does not have a unitary position, since it is based on several assumptions and these are grouped into three positions: Cognitive Constructivism, Social Constructivism, and Radical Constructivism. The study was based on social constructivism because it was majorly interested in cultivating teacher educators' and trainees' digital skills and knowledge through an interactive process between the teacher, learner, and content.

Social constructivism

According to Jafari and Hanieh (2015), social constructivism is a theory of knowledge in sociology and communication theory that examines the knowledge and understandings of the world that are developed jointly by individuals. Social constructivism is a social learning theory developed by Russian psychologist Lev Vygotsky, and posits that individuals are active participants in the creation of their own knowledge (Schreiber & Valle, 2013) in Michelle & Jasper (2017). This theory looks at learners as active participants not passive recipients of knowledge, so they are fully involved in knowledge construction process. The theory assumes that understanding, significance, and meaning are developed in coordination with other human beings. Accordingly, Derry (1999) and McMahon (1997), cited in Jafari and Hanieh (2015), culture and context in understanding what occurs in society and knowledge construction are a major emphasis of social constructivism. In the same line, Nastasi, Arora & Varjas (2017) look at culture as a system of meaning, which helps individuals and communities to organize, through a process of co-construction via social interaction, the multiple components of their world into a coherent whole. Sivan (1986) on the other hand defines culture as, "the features in a group of people, such as beliefs, social forms, knowledge, and the means of transmitting knowledge, that distinguish those people from another group" (p. 213). It must be noted that, social constructivism represents knowledge as a human product that is socially and culturally constructed (Ernest, 1999; Gredler,

1997; Prat & Floden, 1994, cited in Jafari and Hanieh (2015). Individuals can create meaning when they interact with each other and with the environment they live in.

Gergen (1995) indicates that cultures influence social interaction by placing differing values on the participants. These values could be based on individuals or may simply be intuitional aspects which interfere with social interactions. Learning is social, implying social interaction plays a fundamental role in the development of cognition; therefore, it is very fundamental to look at both the social and cultural processes. Vygotsky highlighted that cognitive activities or learning always takes place at: the social as well as the individual levels; first, from the interactions amongst people, an individual develops personal cognition and can now make arguments that originate from his or her mind. Learning can be interpreted as participation in communities of practice. The practice concept includes practical and theoretical, ideals and reality, talking and doing. Communities of practice have been applied in networked learning communities and the conditions for example in; e-learning and on-line learning, that is, sharing ideas on-line. Vygotsky emphasizes that, knowledge is the outcome of individuals' social, as well as cultural interactions. From Vygotsky's perspective, knowledge exists on two levels: the interpersonal (external level) and the intrapersonal (internal level). Learners cannot gain the latter (internal) without reasonable exposure to the former (external). The intention is to create learning environments that are centered on students as learners and a belief that they learn more from what they do and think about or share from colleagues rather than from the traditional lecture methods which are teacher centered. Effectively, integration of ICT in practice provides important tools with which to accomplish the goals of a social constructivist classroom (Mcleod, 2013).

Conceptually, the term **Digital** refers to information represented in numeric form and primarily used by a computer (Kirsti, 2011), whereas **competency** refers to a combination of, ***knowledge*** **and** ***skills***. Knowledge means information in the mind, ability to understand something, possess some information whereas skills refer to the practical proficiency, potential or ability to

perform something in a practical sense. According to Wikipedia, knowledge is a familiarity, awareness or understanding of someone or something, such as facts, skills, or objects. Knowledge can be acquired in several ways and from many different sources such as perception, reason, memory, testimony, scientific inquiry, education and practice. Knowledge can refer to a theoretical or practical understanding of a subject as this can be implicit (practical skill and expertise) or explicit (theoretical understanding of a subject). Whereas a skill on the other hand again according to Wikipedia, is the ability to perform an action with determined results often within a given amount of time, energy, or both.

We have both general skills such as time management, teamwork, leadership, motivation and also specific skills which would be used only for a certain job and these may include facts learned about a specific subject, direct instructions, and mathematical skills extra. Ferrari (2012) went ahead to define ***digital competence*** as a set of; knowledge, skills, attitudes, abilities, strategies, and awareness required when using ICT. Digital competence is not simply about acquiring ICT competency, but rather the ability to suitably; select, use, mix, and integrate many sets of pedagogy and technology. Once theses competencies are achieved and contextualised, they create new learning environments in which learners take decisions about their own learning while teachers facilitate the process.

Digital competence in this study was viewed as the technology: *knowledge (**k**) and skills (**s**)* from the following dimensions: research (**k**), content analysis (**k**), media literacy (**k**), negotiation (**k**), content creation (**s**), information management (**s**) and communicative (**s**), problem solving (**s**). Whereby; creative implies meaning making or knowledge modification; problem solving means, identifying needs and technological responses, identifying digital competence gaps, to understand where own competence needs to be improved or updated, to support others in the development of their digital competence, to keep up-to-date with new developments; analysis is the ability to understand the process, the logic and the objective of the created media, it is the cross examination

of created content and any other digital content, looking at its potential to facilitate or empower learning of the 21st century; Content creation refers to the ability of developing content, creating content in different formats including multimedia, to edit and improve content that s/he has created or that others have created, to express creatively through digital media and technologies, programming (to apply settings, programme modification, programme applications, understand the principles of programming, to understand what is behind a programme); information management refers to; browsing, searching and filtering information, storing and retrieving information then, communicative refers to the ability to interact through technologies, potential to share information and content, collaborating through digital channels and also managing digital identity.

Teaching is defined as; the planning, execution, and evaluation of learning process (Alexander, 2004). In this study, teaching referred to; knowledge facilitation involving; planning, content delivery, interactivity, assessment, and feedback. Higher education according to Lumumba (2006) refers to all organized learning and training activities at a tertiary level whereas university education in particular refers to the totality of general and specialized knowledge and skills that enable a university graduate to solve problems that he/she encounters in the industry. Teacher education is a programme related to the development of teacher proficiency and competence that would enable and empower the teacher to meet the requirements of the profession. According to the International Encyclopedia of Teaching and Teacher education (1987), teacher education has three phases: Pre-service, Induction and In-service. A teacher educator is a person who educates the pre-service teachers or a person who works in the tertiary institutions and is largely involved in the teaching of prospective teachers (John, 2002). Teacher educators in Makerere University structure are categorized into levels based on qualification and experience, that is: professor, associate professor, senior lecturer, lecturer, and assistant lecturer.

Learning according to Kharad and Thakkar (2012) in the constructivist-oriented approach, is regarded as the result of learners' action of constructing and transmitting knowledge, based on

personal experiences and social interactions among the peers as well as the individual or group interaction with the environment. The study looked at learning as a process that generates new knowledge resulting from social interactions between learners, teachers, and content.

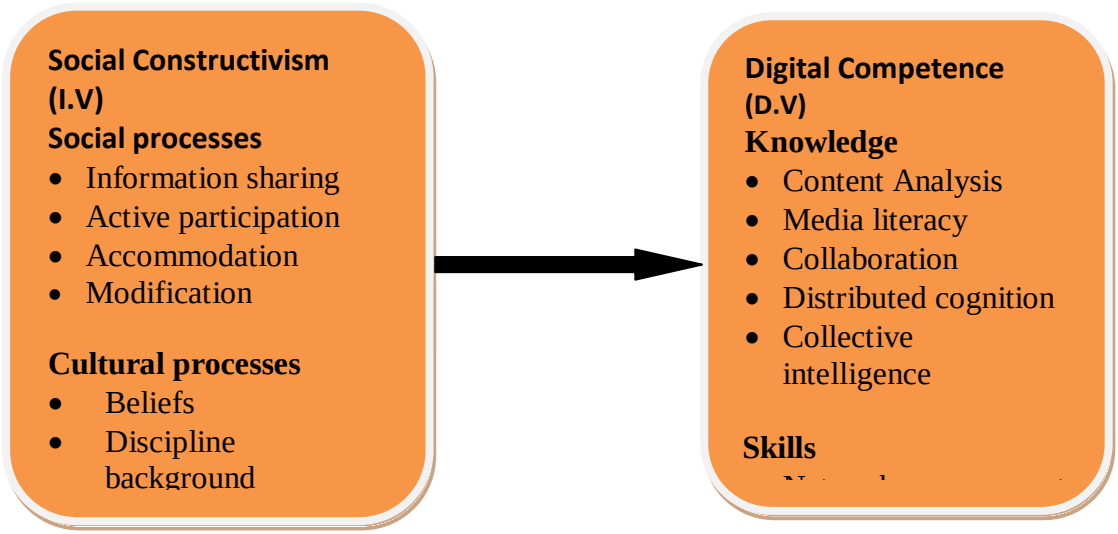
Pedagogy is derived from a Greek word meaning "to lead the child" and according to The Department of Education, Employment and Workplace Relations (DEEWR), (2009a, p.42); it is the art or science of teaching, education instructional methods or strategies. Whereas **e-pedagogy** refers to teaching approaches that utilize the affordances of digital information and communication technologies and cater for the learning preferences of the digital generation (Wee Hin, & Subramaniam, 2009); it also refers to the study of teaching via the Internet, or the study of online instruction (Swartz, Cole, & Shelley, 2009).

Conceptual Framework

According to Mvududu & Thiel-Burgess (2012) argued that learning is a social process that involves the; cultural, historical, and personal interactions (social processes) that take place between and among individuals. Social processes are those activities, actions, and operations that involve the interaction between people. We need to note that social processes can be categorized as follows: ***attrition*** which refers to the reduction in a work or labor force due to retirement, dropping out of the labor force, job change, and emigration; ***education and training*** which implies the processes of developing new skills and knowledge in the individual; ***experiencing*** and this is about apprehension or participation of an object, thought, emotion, or event through the senses or the mind; ***motivational development or loss*** which means decreasing or increasing of the desire to perform an activity and also ***social conflict*** which refers to the destruction or alteration of endowments by riots, war, terrorism, or other large-scale social conflicts. However, social processes in this study concentrated on education and training since our study aim was about developing teacher educators' and trainees' technology knowledge and skills.

Vygotsky's theory emphasizes the role that language and culture in the cognitive development of learners by providing frameworks in which students can experience, communicate, and make sense of their reality. According to Vygotsky (1978), the means by which culture and knowledge are transmitted influence the way learners think, act, and the meaning that they make. And so, the formation of new knowledge and new learning is a shared, collaborative experience that cannot happen for an individual in isolation (Mondahl and Razmerita, 2014). According to Sivan (1986, p. 214) culture provides the context in which the tools and signs (e.g., language and numbers) and knowledge. Social constructivism theory looks at learning as an active process in which students bring prior knowledge to a new context and negotiate incoming information to form new understandings and knowledge from a more knowledgeable person. Looking around the attainment of a positive process of teaching and learning basing on social constructivism, ICT is the most suitable tool which can ably support learner, teacher, and content interactions, as it promotes environments that are action-oriented, and it is through these technological environments that the teacher trainers as well as trainees gain the required ICT knowledge and skills to manage the teaching/learning process. The framework below tries to highlight key aspects that the study emphasized and trying to show the connection of the study concepts in form of both the independent and dependent variables.

Figure 1.1: Represents concepts behind social, cultural processes and digital competence



Source: Vygotsky' Social Constructivist teaching approach modified by the researcher

Social constructivist approach emphasizes learner-centered pedagogy through social processes on one hand in which learners collaboratively construct their own knowledge via: information sharing, active participation, accommodation, and information modification. Cultural processes on the other hand were looked at in form of, beliefs, feelings, attitude, discipline background, leadership culture, policy guidelines, curriculum, and structural facilities. Disciplinary background as a concept originates from Biglan (1973) who terms these academic disciplines as, "classification of knowledge". Academic disciplines associate positively with digital knowledge and skills. Biglan classified academic disciplines into; "hard", "soft", "pure", and "applied". So, an academic discipline can be hard pure or hard applied, soft pure or soft applied. The specific examples given within each category include natural sciences (hard pure); engineering (hard applied), social sciences and humanities (soft pure) and then nursing, education (soft applied). Biglan argues that, the nature of an academic discipline, particularly in terms of its responsiveness to answer the demands of the society and the tolerance of the individual approaches or experimentation might provide some answers to why a disciplinary group or some members of a certain academic discipline may adopt or resist an innovation like ICT integration in teaching.

Leadership culture, policy guidelines, curriculum and structural facilities are very influential in the process of acquiring digital knowledge and skills. The leadership culture of a university for example plays a major role in staff training, adoption, and institutionalization of an innovation. Technology integration in teaching and learning is largely regarded as a challenging innovation for universities because of different leadership styles and interests of university administrators. A university leadership that tries to create an enabling psychological, structural and policy environment for integrating technology in teaching will promote the innovation in question. University leadership needs to first understand the societal demands, so that it can provide opportunities for the acquisition of technology knowledge and skills, but also look out for the

necessary structural resources to support the innovations. Policy on the other hand is an important institutional factor which can help to promote technological transformation. Education institutions that aim at promoting technology integration in teaching and learning have put in place policy guidelines to promote teaching and research.

Universities need to put in place clear guidelines on how to integrate ICT in its services especially teaching and learning for example, the practical use and accessibility to ICT resources within the university must be guided and fully regulated. Structural facilities: at any single point, technology integration is incomplete minus the necessary facilities such as computers, internet services, projectors, printers, and other software. The academic culture: this basically consists of the norms and values common to all academics, irrespective of their disciplines. This includes the norms and values that support academic freedom, individual autonomy, collegial governance, and knowledge generation. An innovation of any kind gains attention when the academics have the freedom to act, associate and explore its benefits. Curriculum design and execution is an institutional factor which can promote the adoption of technology in teaching. So, the above social processes and cultural processes equally have the potential to significantly influence technology knowledge and skills of teacher educators at university. The duo are elements of social constructivism which looks at teaching and learning as a socializing process where individuals gain knowledge and skills through collaborative activities.

On the other hand, digital competence supports the new ways to foster social interactions and therefore, teacher educators need to possess technological, knowledge and skills. Accordingly, social interaction is the basis for cognitive growth; it is the intellectual potential of an individual when provided with assistance from a more advanced peer (teacher-trainer). Digital competence in this framework was conceptualized as technology: *knowledge (*k*) and skills (*s*).* By technology knowledge, the researcher looked at the general awareness and possession of

information in the mind or understanding which can guide someone to perform some roles. Specifically, under this area, the following dimensions were analyzed: content analysis (k), media literacy (k), collaborative (k), distributed cognition (k) and collective intelligence (k); whereas by skill, the researcher looked at the ability to do something, the accuracy of performing a certain task, and this area was viewed through the following dimensions: network management (s), communicative (**s**), information management (**s**), content creation (s) and problem solving (s). Whereas after gaining digital competence, it is then assumed that teaching is influenced in form of, planning, content delivery, interactivity, assessment and feedback.

Vygotsky (1987) emphasizes that social interactions promote individual skills and knowledge, and these interactive environments can be well facilitated by tools like computers and other communication technologies such as phones which in the end facilitates learning. Programs like MUELE generally known as Moodle is used for producing internet-based courses aimed at supporting a social constructivist approach of education (Dougiamas, 2006). The program has got tools that are accessible in the system like; forums, chat rooms, a dialogue tool, wikis, glossaries, quizzes a workshop tool etc. aimed at supporting collaboration, activities, and social construction of knowledge. Moodle encourages collaborative work also by providing a differentiated group mode and the ability to network course teacher trainers. In addition, this platform is extremely flexible and easy to use for beginners. At the same time, it is "scalable" to accommodate complex learning and teaching scenarios.

Contextually, my interest in educational technology began way back in 2005 when I enrolled for a master's degree in ICT with Education from Makerere University and in the same year I was recruited at Nkumba University as a teaching assistant to teach computer applications in education to the teacher-trainees. By Educational technology, we are referring to instructional/learning technology as a study and practice of improving student learning and

performance by creating, using, and managing technological processes and resources for classroom instruction. On my scholarly practitioner journey, I have become increasingly aware of the variance, or lack of variance of technology implementation in instructing the teacher trainees. While some educators still see technology as a separate subject to be taught in scheduled computer lab time, instruction technology experts will look at technology integration as the use of computer-based tools to teach educational curriculum while developing teacher trainees' technology skills and knowledge. When we have the technology to create diverse, engaging, collaborative, and democratic learning communities for our future teachers we should be establishing best, or at the very least, better practices that will provide these teachers trainees with a practical means of integrating technology into the curriculum. On the other hand, I am very well familiar with Makerere University, and in particular School of Education because for quite a long time I served as an I.T support staff in The School of Education and I was part of the team which supported both students and academic staff in a number of ICT initiatives such as; Blackboard, KEWL and Moodle which were introduced to promote ICT integration in teaching, however technology integration levels of both teachers and students remained very low.

I positioned myself in social constructivism because I believe that people construct knowledge themselves and do not acquire it from outside, but through the various forms of interactions between people and things or tools such as technology tools. In the bid to help learner build their own knowledge through interaction, teacher trainers must adopt technologies that will support this orientation. I have realized that social constructivist learning approach requires the learner to actively participate in creative activities and self-organization. In this way, teacher trainers need to allow their students to come up with their own questions, make their own theories, and test them for viability. Learners must be allowed to realize an imbalance between what they may know and reality, so that in the end, it facilitates learning. It is these contradictions between the learner's current understanding and experiences which create an imbalance, which leads the

learner to inquire into his or her own beliefs and then try out new ideas. Instructors should therefore encourage errors resulting from the learners' ideas, instead of minimizing or avoiding them. To acquire technology integration in teacher education without formal training, teacher educators and trainees need to embrace social interactions, the need to learn from one another is the way forward, teachers learn from their learners and vice versa.

In fact, in Uganda, before 2003 ICT investments and use in education were not guided by any agreed framework, but rather the different institutions and schools at the different levels led their own initiatives mainly funded on bilateral terms between the school and their donor(s) (Hennessy, Onguko, Harrison, Kiforo, Namalefe, Naseem & Wamakote, 2010). Again Hennessy et al. (2010), indicate that, in 2003, a national ICT policy framework was put in place and its objective number two was to improve human resource capacity and building. Among the strategies for attaining this objective was to integrate ICT in mainstream educational curricula as well as other literacy programmes and provide for equitable access by pupils and/or students at all levels (Uganda; Ministry of Works, 2003). Along the same line, The National ICT policy of 2012 (MOICT, 2012) spells out key aspects to promote ICT in teaching and learning and these include; review curricula at primary, secondary and tertiary levels in order to pedagogically integrate ICTs in the teaching and learning process; improve the level of investment in educational ICT equipment, software as well as broadband connectivity of primary, secondary and tertiary institutions; impart teachers with the necessary ICT skills in order to enable them use ICTs in the teaching and learning process; establish educational networks for sharing educational resources; promote the growth and implementation of open, distance and e-learning (ODeL) modes of study; and create opportunities and provide assistance for the disadvantaged, people with special needs, women and the youth to acquire ICT skills. So, the increased use of computer technology in teaching and learning has increased demand for higher education, reduced funding for higher

education and changed the way the current generation of learners study by changing the content delivery approaches.

Ezati, Opolot & Namubiru (2014) noted that, there is a shift from teacher-centered to learner-centered approach which calls for a change in the roles of both universities and staff. Student-cantered teaching tends to improve student satisfaction with the learning experience and deepens students' understanding of how the knowledge may be valued in their own lives (Nilson, 2010; Weimer, 2013). Learner-centered approach in this case implies, changing the pedagogy by; adopting digital devices such as computers and the related devices to facilitate learning. Several attempts have been made at Makerere University to promote ICT integration in teaching and learning to enhance quality teaching and learning. For example, Makerere University ICT Master Plan (2010 – 2014, page 16), "*it is University Policy to train staff on a continuous basis in basic ICT skills and other skills relevant to their jobs and require that all new staff to be recruited possesses the relevant ICT skills for the jobs applied for"*. The College of Education and External Studies has had several training programs for teacher educators in ICT integration (CEES strategic plan: 2011/12 – 2018/19). With support from: Norwegian Agency for Development Cooperation (NORAD); the Department for Research Cooperation of the Swedish International Development Cooperation Agency (Sida-SAREC); the US-based Carnegie Corporation; the Ford Foundation and others, teacher educators in this College have been highly supported in the integration of ICT in teaching (PHEA, 2011). However, teacher training program in this College has remained teacher centered.

Lubega et al. (2014) revealed that, there is limited use of ICT for pedagogical purpose at Makerere University. These researchers found out that, majority of the lecturers at Makerere are digital immigrants, which means, they are not familiar with ICT integration in teaching, this might result into ineffective teaching and learning because, the digital natives (current generation of learners) prefer to study in a highly interactive, collaborative as well as independent manner

(learner-centered approach). Onex (2013) found out that, much as ICT use in the College of Education and External Studies (CEES) was viewed as an important instructional artifact, it has only helped lecturers in preparing lecture notes. Muyinda (2013) also reported that, most of the lecturers at Makerere University (almost 75%) simply use ICT to prepare lecture notes, assignments, tests, and examinations. Muyinda further reports that, MUELE; a University electronic learning management system is mainly used as content storage.

Statement of the problem

There is private and public outcry that the quality of teaching and learning at institutions of Higher learning does not reflect the students' readiness for the world of work. However, Kahiigi (2013) reported that, the increased student enrolment at Makerere University has made teaching almost impossible; large classes most especially in art-related disciplines ranging between 50 and 1000 chasing scanty resources have suffocated the academic standards in the University and School of Education in particular, which calls for an immediate attention. Whereas in a situation like this, the application of ICTs in teaching can reduce such problems and improve students' achievement, promote deep learning, and improve levels of academic engagement (Nakayima, 2011; Jamieson-Proctor et al., 2013; Cassim & Obono, 2011; Eyyam & Yaratan, 2014; Navarro, & Sánchez, 2014).

Despite the need for integrating digital practices into the pedagogy of higher education institutions in Sub Saharan Africa, there is limited empirical evidence of, and robust interventions for improving the readiness capacities of lecturers and students. At least in the case of School of Education, Makerere University, to integrate ICTs in teaching, anecdotal evidence shows that extant interventions for cultivating educators' digital competences, such as training workshops are divorced from robust education theories and ICT integration approaches. It is alleged that there are low levels of digital competence amongst the teacher educators (Ezati, Opolot & Namubiru, 2014). Teacher educators' digital competence levels at Makerere University have lagged far

behind and hence, and teaching has often remained teacher centered (Lubega et al., 2014). Muyinda (2013) attributed this to; unfavorable policies in the University; high preference for teacher-centered paradigms; lack of interest for ICT integration in teaching. This study therefore explored the innovative pathways provided by the social constructivist approach to cultivate teacher educators' and trainees' digital competence at Makerere University, School of Education.

Study Purpose

The study aimed at establishing how the social constructivist approach can be applied to nurture teacher-educators' and teacher trainees' technology knowledge and skills at Makerere University.

Study objectives

The study aimed at achieving the following objectives:

1. Nurture teacher-educators' and teacher trainees' technology knowledge using social processes at Makerere University.
2. Nurture teacher-educators' and teacher trainees' technology skills using social processes at Makerere University.
3. Find out how cultural processes influence teacher-educators' technology knowledge and skills at Makerere University.

Research questions

The study was guided by the following research questions:

1. What particular technology knowledge can be acquired by the teacher-educators and teacher trainees from the social processes at Makerere University?
2. What particular technology skills can be acquired by the teacher-educators and teacher trainees from the social processes at Makerere University?
3. How do cultural processes influence teacher-educators' technology knowledge and skills at Makerere University?

Study Scope

The study was conducted in Makerere University with an assumption that being a government founded university, there is availability of funds, and hence there is easy facilitation in terms of equipment and skills. Makerere University is located in Kawempe Division. It is bordered by Bwaise to the north, Mulago to the east, Wandegeya and Nakasero to the southeast, Old Kampala to the south, Nakulabye to the southwest. Kasubi and Kawaala lie to the west of Makerere. This location lies approximately 2.5 kilometres, north of Kampala Central Division. The coordinates of Makerere are: 0° 20' 6.00"N, 32° 34' 12.00"E (Latitude: 0.3350; Longitude: 32.5700). This study was carried out from the School of Education, College of Education and External studies (CEES), Makerere University. The content scope was to establish the state, nature of utilization of E-pedagogy in Makerere University Teacher education programmes, examining how the use of social constructivist approach promotes teacher-educators' digital competences in teaching at Makerere University. The study considered a time scope between (2010-2018) because this is the period when serious efforts to integrate ICT in teaching were quite high at Makerere University, (PHEA, 2011; The University Strategic Plan 2008/09-2019/19; Master Plan 2010 – 2014 and Makerere University Annual Report, 2013).

Study significance

This study intended to provide a new approach on how best to promote the development of digital competences in teacher- training program at Universities, a case of Makerere University.

University managers: the results of the study might be adopted to guide University administrators on issues of policy and financing of ICT training workshops for lecturers across the University including the operationalization of the ODeL Policy.

Teacher trainers: Today with ICT in place, there is no room for excuse of the inability to explore the different technology skills and knowledge that facilitate teaching, so teacher educators may benefit from the new insights on how to equip pre-service teachers with E-pedagogical skills

and knowledge and hence this will help both the teacher trainers and trainees to shift from teacher-centered form of instruction to learner-centered approaches.

Student teachers: most especially the pre-service teachers will gain the pedagogical values (knowledge and skills) of adopting ICTs to facilitate teaching and learning at primary and secondary education levels.

Ministry of Education & Sports: The study findings might guide the Ministry especially on the priority areas in ICT integration for teachers in both primary and secondary schools in the Country.

Funders: the study results might be used to guide on the major areas of emphasis where training and research are still necessary in terms of promoting ICT use to facilitate teaching and learning in universities which may require more financial support.

Researchers: the findings of this study will add to the existing body of literature about teacher training and use of ICTs in teaching and learning.

This study has a lot of importance, because it focuses on teacher educators, who have got an enormous and direct influence on future teachers' ability to develop and formulate innovative educational practices for the 21st century teaching and learning, ICT integration. It has been learnt that the use of ICT in teaching promotes student-centered learning, higher order thinking, problem-solving, cooperative learning, clarification of abstract concepts and transformation of the understanding of the subject matter (Smeets, 2005; Leach & Moon 2000; Bangert, 2008). The study has come at the right time when all parents and sponsors plus the school administrators are complaining about students' academic grades. The issue of teach-to- test has spoilt our education systems, whereby schools today produce children who are not critical thinkers, but only trained to cram and pass exams, our learners lack higher order thinking skills, knowledge application is too low. The study aims at promoting student-centered teaching/learning approaches that make use of technologies, we need to have knowledge constructors not consumers, and the solution is

adoption of ICTs in teaching. But again, the desire of preparing highly skilled teachers who are capable of meeting international standards in the era of information technology motivated the researcher to carry out such a study. On the other hand, due to the increased student enrollment at Makerere University, the quality of teaching and learning has gone down (Kahiigi, 2013) which calls for new approaches of teaching and learning. Being an educationist also, a teacher educator for more than ten years, I feel obliged to do a study and learn more about how these technologies can better be applied to facilitate teaching and learning.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter is an explanation of the complete and current state of knowledge on teacher educators' digital competence cultivated by social constructivism as found in academic books and journal articles aimed at identifying the inconsistencies, gaps and contradictions in the literature. So, the chapter includes the theoretical review and the review of related literature on the following themes: social processes and teacher-educators' technology knowledge, social processes and teacher-educators' technology skills and then cultural processes and teacher-educators' technology knowledge and skills in teaching.

Theoretical Review

The study was based on Constructivist approach which has several perspectives whose lenses about knowledge construction vary. The philosophy of this theory maintains that people construct knowledge but do not acquire it from anyone. So, the theory looks at learning as an active process where information is presented to the learner in a form which facilitates the freedom to make personal interpretations and thus meaning making. Constructivists believe that, people develop knowledge individually in social learning environments by constructing their own schema based on the information presented to them Doolittle & Hicks (2003). Accordingly, to Doolittle & Hicks (2003), constructivism is divided into three major forms which include: *Cognitive Constructivism*, *Radical Constructivism* and *Social Constructivism*, while these three approaches share a common general epistemological stance (Gray, 2014), they each differ in their theoretical perspectives and applicability:

Cognitive Constructivism. Cognitive takes its name from the word cognition, which means the process of knowing. Cognitive psychology places emphasis on unobservable constructs, such as the mind, memory, attitudes, motivation, thinking, reflection, and other presumed internal

processes. Cognitive constructivism represents one end, or extreme, of the constructivist continuum and is typically associated with information processing and its reliance on the component processes of cognition. Cognitive constructivism emphasizes two tenets; knowledge acquisition is an adaptive process and that results from active cognizing by the individual learner. These epistemological emphases lead to defining principles that maintain the external nature of knowledge and the belief that an independent reality exists and is knowable to the individual. Knowledge then, from the cognitive constructivist position, is the result of the accurate internalization and (re)construction of external reality. The results of this internalization process are cognitive processes and structures that accurately correspond to processes and structures that exist in the real world. This claim, that reality is knowable to the individual, differentiates cognitive constructivism from both social and radical constructivism.

Doolittle & Hicks (2003) further indicate that, this process of internalization and (re)construction of external reality is a learning process of building accurate internal models or representations that mirror or reflect external structures that exist in the "real" world. This perspective on learning focuses on (a) the procedures or processes of learning, (b) how what is learned is represented or symbolized in the mind, and (c) how these representations are organized within the mind. And as a learning theory, it is often considered a "weak" form of constructivism, within the constructivist community since it only embraces two of the four epistemological tenets. "Weak" in this case is not a value judgment, such as better or worse, but rather merely an indication of adherence to foundational assumptions. Thus, knowledge construction is considered primarily a technical process of creating mental structures but has little bearing on the nature of the subjective knowledge within the mind.

Radical constructivism. Radical constructivism represents the opposite end of the constructivist continuum from cognitive constructivism. Radical constructivism fully embraces the

first three epistemological tenets, that is, knowledge acquisition is not passively constructed but rather a process that results from active cognizing by the individual learner, Cognition is an adaptive process, knowledge is a result of an individual's experience with external world. The adaptive nature of knowledge underscores that knowledge is not objective "truth," that is, internal knowledge does not match external reality, but rather is a viable model of experience (von Glasersfeld, 1995). These viable models are created within an individual, influenced by the context within which an activity was experienced, and relative to the accomplishment of a particular goal. Thus, according to Staver (1995), knowledge is knowledge of the knower, not knowledge of the external world; and that improving knowledge means improving its viability or fit in, but not match with, an external world. The theory is concerned with both the construction of mental structures, the position of cognitive constructivists, and the construction of personal meaning. In this sense, radical constructivism involves a greater degree of construction than does cognitive constructivism, involving two planes of construction, structure and meaning, rather than only one, structure. However, Radical constructivism does not fully support the forth epistemological tenet of constructivism.

Social constructivism. Social constructivism lies somewhere between the transmission of knowable reality of the cognitive constructivists, and the construction of a personal and coherent reality of the radical constructivists. Social constructivism, unlike cognitive and radical constructivism, emphasizes all four epistemological tenets. These particular epistemological emphases lead to defining principles that maintain the social nature of knowledge, and the belief that knowledge is the result of social interaction and language usage, and thus is a shared, rather than an individual, experience (Prawatt & Floden, 1994). In addition, this social interaction always occurs within a socio-cultural context, resulting in knowledge that is bound to a specific time and place (Gergen, 1995; Vygotsky, 1978). This position is exemplified by Bakhtin (1984), "truth is not to be found inside the head of an individual person, it is born between people collectively

searching for truth, in the process of their dialogic interaction" (p. 110). Truth, in this case, is neither the objective reality of the cognitive constructivists nor the experiential reality of the radical constructivist, but rather is a socially constructed and agreed upon truth resulting from "co-participation in cultural practices" (Cobb & Yackel, 1996, p. 37). Like radical constructivism, social constructivism would be considered a "strong" form of constructivism, emphasizing all four of the epistemological tenets. However, social constructivists generally downplay the mental construction of knowledge (not because social constructivists do not believe in mental construction but because it is seen as relatively trivial) and emphasize the co-construction of meaning within a social activity. In this sense, social constructivism is more concerned with meaning than structure.

The study was based on social constructivism (Vygotsky, 1978) as the foundation theory due to the fact that the researcher was emphasizing the idea of shared experience, learning from others, cooperative or group learning which creates a shift from teacher centered to learner-centered pedagogy which involves appropriation of new technologies as supportive tools to the learning process. According to Jafari and Hanieh (2015), Social constructivist scholars view learning as an active process where learners should learn to discover principles, concepts and facts for themselves, hence they encourage and promote the guesswork and intuitive thinking in learners. It highlights that reality is not something that individuals can discover because it does not pre-exist prior to their social invention of it. Other constructivist scholars such as (Lave & Wenger, 1991; McMahon, 1997 cited in Jafari and Hanieh 2015) agree that individuals make meanings through the interactions with each other and with the environment they live in. social constructivist teaching approaches emphasize reciprocal teaching, peer collaboration, cognitive apprenticeships, problem-based instruction, web quests, anchored instruction, and other methods that involve learning with others .Instructional models based on the social constructivist perspective propose the need for collaboration among learners and with practitioners in the society.

Jaworski (1994) highlighted six major characteristics of Social Constructivism and these are;

1. *Active construction* of knowledge based on experience with and previous knowledge of the physical and social worlds- use of relevant and authentic tasks so as to obtain problem solving in real world situations.
2. Emphasis on the need for the *ZPD*, critical role of peers, in particular more skilled students.
3. Emphasis on the influence of *human culture* and the *socio-cultural* context- enculturation of students into the community of the particular academic discipline or profession
4. Recognition of the *social construction* of knowledge through dialogue and negotiation- Collaboration in the learning process.
5. Emphasis on the *inter-subjective construction of knowledge*.
6. *Multiple interpretations of knowledge*, appreciation of multiple perspectives- opportunity for students to publicly share their work, revise their work based in social critiques, and reflect on what they have learned with others.

Other scholars like; Lave and Wenger (1991) assert that the relations among practitioners, their practice, and the social organization and political economy of communities of practice are all important and effective in a society's practical knowledge. We are talking about learning that occurs as a result of individual members sharing experience, and so, we are looking at learning as a social process that calls for the full participation of both the teacher and the learner; it is not where the teacher is the only expert of knowledge, a master of the content, but rather a facilitator of the learning process. This process therefore calls for preparation to use technology tools which promote learner-teacher and content interaction, Sheridan (2015) looks at it as a collaborative process within discussion boards, newsgroup, or various chats on social media. Although Sheridan did not address the particular technology skills and knowledge that would be used to promote the collaborations, hence the need to establish this fact by engaging in a real intervention with teacher

educators and trainees. Hence, the study tried to address these learning interactions and their role in helping the teachers and learners to master technology skills and knowledge that will promote smooth learning outcomes. Pedagogy involves interactions between; learners, lecturers and content, this study therefore is based on a social constructivist theory proposed by Lev Vygotsky in 1978 as the most suitable approach to support this cause. Social constructivist concepts have widely pervaded contemporary debates in the literature about teaching and learning (Oxford, 1997), especially teacher education in enhancing students' learning (Gordon, 2009b). The underlying philosophical views of social constructivism are that people create knowledge from their real-world context. Social constructivist theory was used as a lens for this study and central to this theory is the individual human who via interaction with others creates knowledge in the views of his/her respective cultural context (Baviskar, Hartle, & Whitney, 2009).

Beck and Kosnik (2006) identified the key beliefs of the social constructivist theorists thus: knowledge is constructed by students, knowledge is experience-based, learning as a social dimension, all aspects of a person (i.e., attitude, emotions, values, and actions) are connected and also all learning communities are inclusive and equitable. Unlike classroom and traditional learning, the emphasis of social constructivist learning is to transform traditional learning beyond educator-centered learning to achieve learner-centered, problem-based and collaborative learning environments (Alexander, 2008). As such, this form of learning focuses on understanding learners' views and feelings and creating conducive environments towards problem solving other than just imparting knowledge to learners; involvement of the students in everything going on during the lesson. Social Constructivism as a learning theory posits learners construct knowledge and meaning through the process of sharing their ideas and opinions with others and in turn reviewing the ideas and opinions being shared (Orlando, 2013).

Although constructivism is not regarded as pedagogy per se, Orlando argued it has nonetheless had a significant impact on contemporary learning theories and educational practices.

The connection between ICT pedagogy and social constructivist pedagogy is that, constructivist practices promote student-centered learning. Implying that, ICTs are used as tools in the classroom in such a way as to facilitate 'teacher-student and student-student collaboration and co-construction of knowledge'. This is in contrast to more traditional teacher-centered practices that simply utilize ICT for instruction and knowledge transmission. This changes the teacher's role to not causing the learning, but rather helping to learn to occur (Nichols and Anderson, 2005). Rodriguez (2014) surveyed literature regarding social constructivism, and he emphasizes that social interactions are well facilitated by education software such as online collaborative software. However, we notice that these studies do not clearly provide a practical framework for ICT integration in teaching and learning, hence this leaves a serious implementation challenge.

On the other hand, social constructivism addresses learning as a holistic concept, not simply the grades. Education systems especially in Uganda today have put a lot of emphasis on the grades learners attain after a completion of a certain level such as Uganda Certificate of Education (UCE), Uganda Advanced Certificate of Education (UACE). Parents too always look out for the schools which attained more "good" grades and that is where they will always take their children. A child who fails the final exams at a given level of education is regarded as not "intelligent", despite the fact that such a child might have performed relatively poor due to certain factors that are non-academic. Adams (2007) refers to this kind of teaching process as a 'human-as-machine' analogy, whereby learners can be programmed and reprogrammed. So, constructivist learning orientations seek to understand how pupils create their knowledge constructs and what these mean for understanding influences on thought processes. The nature of constructivist learning requires teachers to adopt the view that each learner will construct knowledge differently and that these differences stem from the various ways that individuals acquire, select, interpret and organize information. Adams looks at learning as an active process of constructing knowledge to make sense of the world.

Social Constructivism and ICT Pedagogy

Despite the availability of ICT facilities in teacher education institutions in Uganda today, many teacher educators have remained using traditional teaching approaches of teacher-centeredness. According to Bahufite (2017) the social constructivist approach, ICT comes in as a common factor in the sense that it provides a rich environment, capable of helping learners gain new experiences and enhance collaboration, discovery and social interaction. ICT used in education offers a virtual learning environment rich in stimuli and able to modify the nature of education, minimizing the indispensability of the teacher's action hence maximizing the learners' involvement through discovery and exploration in full motivation. The theoretical proponents of social constructivism indicate that; *1) Learning takes place in authentic and real-world environments.* Whether building accurate representations of reality, consensual meanings in social activities, or personally coherent models of reality, experience is paramount. Experience, both socially oriented and object oriented, is a primary catalyst of knowledge construction. With use of ICTs, learners as well as teachers share experience through online interactions, and major advantage this creates is that, people are free to express themselves since there are learners who feel shy in a face to face session, so this might the time to open up and freely share their views with the rest of the learning community. Computer technologies provide many tools that can be employed in a social constructivist classroom. Some various types include simulation, animations, multimedia presentations, databases, and telecommunications and use technology to assist in the classroom it will provide the students with a more dynamic and interactive environment. (Rice & Wilson, 1999).

2) Learning involves social negotiation and mediation. While only social constructivism emphasizes social interaction as a basis for knowledge construction, cognitive and radical constructivisms do assign social interaction as a role. Social interaction provides for the development of socially relevant skills and knowledge. With use of ICT, social interactions are

promoted through both synchronous and asynchronous communication. Under the synchronous communication, two or more people exchange information in real-time for example through live chat room, Facebook, LinkedIn, Twitter, Video conference, Instagram, etc. Before message exchange in this synchronous scenario can begin, the sender and receiver must establish a communications session and agree which party is going to be in control. Once the session is established, the two-way, give-and-take conversation occurs in actual time. When you type and send a chat message, the party at the other end is present and actively waiting to receive or hear your message and then immediately respond to it. Both parties are working together at the same time with their clocks in lockstep (time zone differences notwithstanding), in other words, synchronized. On the other hand, asynchronous communication does not offer real time chat, so it is the exchange of data between two or more parties without the requirement for all the recipients to respond immediately, such as: use of emails, short messages etc. However, both synchronous and asynchronous communication offers the participants a possibility to share an experience which creates the inter-subjective experience of a mediated encounter. Low & Ang (2011) also comment that many institutions perceive that negotiations mediated through ICT have advantages with regard to cost savings, time reduction, shortening of distances and facilitating gather people in a specific event, especially for emergencies that may arise in the process.

3) Content and skills should be made relevant to the learner. Knowledge can be attained through enhancement of one's adaptation and functioning (i.e., content and skills) and so, content must be relevant to the individual's current situation, understanding, and goal. By using internet technology, both the teachers and students can get up-to-date information that can promote knowledge generation and building. It is this relevancy which leads to an increase in motivation (Pintrich & Schunk, 1996), as the individual comes to understand the need for certain knowledge.

4) Content and skills should be understood within the framework of the learner's prior knowledge. All learning begins within an individual's prior knowledge, regardless of constructivist affiliation.

Understanding a student's behavior requires an understanding of the student's mental structures, that is, an understanding of the student's understanding. Understanding the student's ability to understand concepts is a role of a modern teacher (constructivist) and a teacher who can always follow his/her learners during the routine activities. With the increased demand of education at all levels, the overwhelming student enrolments it might be a nightmare for teachers to follow up every learner, to understand how each learner grasps concepts. However, with the application of Information and Communication Technologies, following up learners is much easier as each learner may have a portal for details, where the reports about progress and information about what has been covered and the extent to which the learner was able to understand the contents. Computer Aided (or Assisted) Instruction (CAI), which refers generally to student self-study or tutorials on PCs, has been shown to slightly improve student test scores on some reading and math skills, although whether such improvement correlates to real improvement in student learning is debatable. On the other hand, use of education software such as; virtual laboratories, could effectively support reflective learning, expand students' learning capacities, and boost knowledge retention.

5) Students should be assessed formatively, serving to inform future learning experiences. Acquisition of knowledge and understanding is an ongoing process that is heavily influenced by a student's prior knowledge. Unfortunately, knowledge and understanding are not directly visible, but rather must be inferred from action. So, to properly understand whether the learner is on track, the teacher must continually assess the individual's knowledge. This formative assessment is necessary to accurately create the next series of experiences and activities for students. This creates a big challenge especially in developing countries where teacher-student ration is over 1:50, individual feedback becomes almost next to impossible. Previously, many teachers have been putting a lot of emphasis on summative assessments (grades, standardized test scores) and evaluations (comparative rankings, annual performance ratings) has resulted in too little emphasis

on and support for formative assessment (individualized and constructive feedback during learning). However, the constructivists recommend timely and formative assessment, and it is the known form of assessment which enhances and expedites learning. The ability of new technologies to provide support for formative assessment has considerably gone up today as a result of intelligent agents, smart devices and cloud-based resources (Benavot, 2015). The most promising technologies mentioned by the New Media Consortium and other groups include MOOCs (Massive Open Online Courses), Serious Games and Gamification, much as still the technology knowledge and skills levels are not reflected here.

6) Students should be encouraged to become self-regulatory, self-mediated, and self-aware. The underlying tenet of social constructivism, and the main thread that holds together the array of theoretical positions, is the claim that learners are active in their construction of knowledge and meaning. This activity involves mental manipulation and self-organization of experience, and requires that students regulate their own cognitive functions, mediate new meanings from existing knowledge, and form an awareness of current knowledge structures. Self-mediation is represented within social constructivism by Vygotsky's (1978) concept of the psychological tool, and Piaget's (1977) concept of reflective abstraction. Vygotsky (1978) believed that students construct mental processes which serve as tools for understanding of concepts and that these tools are used to mediate the cognitive processes. There is significant evidence that, digital technologies represent an open gateway to new learning alternatives and options that favour the acquisition of self-regulation skills (Bernacki et al., 2011; Schneckenberg et al., 2011). Self regulatory kind of learning promotes self-evaluation which a relevant portion aspect in the learning process as it encourages one to ponder his/her own learning (Ibabe and Jauregizar, 2010).

7) Teachers serve primarily as guides and facilitators of learning, not instructors. The role of the teacher in the learning process has often been a major factor in the apparent division between cognitive constructivism and social/radical constructivism. Whereas teachers, in the cognitive

constructivist perspective, are usually portrayed as instructors who "transmit knowledge", which implies in this sense that, the teacher instructs, while the learner learns. In the social constructivist approach, there is no factual knowledge to transmit and the only role for the teacher is to guide students to an awareness of their experiences and socially agreed-upon meanings. This teacher as guide metaphor indicates that the teacher is to motivate, provide examples, discuss, facilitate, support, and challenge, but not to attempt to act as a knowledge conduit. Information and Communication Technologies play a fundamental role in helping the teacher to work as a facilitator of the learning process through posting of the study tasks on the learning platform and the provides guidelines to the learners. Information Technology tools such as; chat rooms or discussion forums support learner-learner interaction where the teacher just comes in to guide the process. According to Kaur (2017), the role of a teacher in social constructivist environment is a co-worker with learners as well as other fellow teachers to create a congenial learning atmosphere for the learners. Jessel (2012) cited in Kaur (2017) suggested that “Innovation arising from new technologies makes a variety of demands upon the role of teacher. In the same line, in the present era of digitalization, the world societies uploaded the teachers with a responsibility to shape the generations for sustainable development of the nations.

8) Teachers should provide for and encourage multiple perspectives and representations of content. In social constructivism there is no privileged "truth," only perceptual understandings that may prove to be more or less viable. So, a student's understanding and adaptability is increased when he or she is able to examine an experience from multiple perspectives. These perspectives provide the student with a greater opportunity to develop a more viable model of their experiences and social interactions. With Information Technology today, content can be delivered to learners in a variety of ways from which the learners identify which form to interact with in a more friendly and usable format. According to (Yadav, 2006), there are six main elements in multimedia applications for educational purposes which are texts, images, audio, video, animations and user

control. Firstly, text is an important element in multimedia applications; it can use to provide information and emphasize specific point by using different styles, fonts, and colours. Secondly, image is an object that has more significant impact than merely reading about text in an educational session. Image can be added to multimedia applications by using colour scanner or digital camera. Examples of image are photographs, artworks, drawings. Thirdly, audio can be used to emphasize certain points and enables teachers to present a lot of information at once rather than use printed learning resources. Audio allows students to use their imagination without being biased, so it will greatly increase the learning outcome. Fourthly, video can be used to present the information beyond the scope of the ordinary lecture room such as medical operations. The use of video to deliver information can be very powerful and immediately, it allows teachers or lecturers to highlight certain key points or tell the students what are going to do next and understand the real life situation. Fifthly, animation is used to demonstrate an idea or illustrate a concept; an object that appears blurry in video can be presented clearly in animation because it can view the changes of the object over time. Lastly, user control uses to provide students with the option to skip particular parts of the multimedia application and allow them to navigate other areas of that program.

Criticisms for Social Constructivism

Social constructivism critics like Kirschner, Sweller, and Clark (2006); Moreno, (2004); Kirschner, Sweller, & Clark (2006, p.6) in Alanazi (2019) argue that, social constructivism promotes a teaching style with unguided or minimally guided instructions for students which may limit learners' ability to understand content. However, these researchers need to understand that, despite the fact that social constructivism promotes group construction of knowledge, this does not mean learners are not given enough guidance. Because the approach encourages discovery learning, in the social constructivist approach learners are given undoubtedly reasonable guidance to allow them discover new meanings on their own. Actually, in the Social Constructivist classrooms purportedly value students' interests and build on what students already know by

providing them with scaffolding instructions. Constructivist supporters advocate that constructivist approaches do not lack guidance, but rather they provide strong forms of scaffolding guidance during activities in learning environments. According to Vygotsky (1978), learners should constantly be challenged with tasks that refer to skills and knowledge just beyond their current level of mastery. This is aimed at capturing their motivation and it helps to build learner confidence. And this is in line with Vygotsky's zone of proximal development, which can be described as the distance between the actual developmental level (as determined by independent problem-solving) and the level of potential development (as determined through problem-solving under adult guidance or in collaboration with more capable peers). So, guidance of the more knowledgeable person is a vital element in social constructivism.

The other concern held by critics of constructivism like Ackermann (2001) is that, learners need to connect their knowledge to tangible objects in order to ensure that they have acquired the knowledge, and constructivist approaches do not support this learning-related need. According to these critics, cognitive learning is not enough for individuals; one must demonstrate knowledge by making artifacts (Papert & Harel, 1991). They give an example of, a web design teacher who may design a lesson plan with the objective that every student should be able to design a web page using Hypertext Markup Language (HTML) by the end of the semester. And that if the teacher were to embrace a social constructivist approach, he or she might have the students discuss designing a web page in a group or complete problem-solving exercises without a large amount of teacher-provided instruction. The perspective that under a social constructivist approach learners merely interact and simply make discussions or conversions is completely not right, because we are aware that constructivism by its nature is action-oriented and so after learners are given clear guidelines, they then perform practical (act-on) through sharing knowledge, and very often for the practical case, these learners are treated in a special way such that, practical examples in this sense are given. Learners may interact after watching a video clip and then perform the requested tasks as there are

in the observed video. Actually many researchers like; Cummings, (2004); Gibson & Gibbs (2006); Shachaf, (2008) have indicated that some of the advantages of social constructivism include; engaging students in learning environments, supporting diversity, creating competitive environments, developing problem-solving skills, promoting social and communication skills (Hmelo-Silver et al., 2007), practicing tacit knowledge (Thomas& Brown, 2011), learning to apply what they have learned practically, and building social relationships among learners (Thomas & Brown, 2011), online collaboration learning (Harasim, 2012). However, these relationships would be more meaningful if there was some of intervention to test the level of technology application.

In Alanazi (2019), a further critique of social constructivist opponents claims that constructivism views learners as interpreting the world differently (Jonassen, 1991) and instructions are, therefore, not effective because critical concepts within the curriculum are not commonly constructed among learners. These critics argue that within constructivist-based pedagogies, giving learners adequate curricula is ineffective because curricula are centered towards all learners in the classroom while every individual has different thinking. Therefore, those who criticize social constructivism argue that common curricula are ineffective and inefficient for learners (Carlson, Lundy, & Schneider, 1992). The misperception here is that, when we talk of individualized curriculum under the constructivist approach, we do not mean that each learner is assigned unique syllabus, but rather we imply the learner will adopt the curriculum and has the freedom to start from the easiest point or major section of interest. There are even other critics of constructivist approaches who argue that social constructivism promotes group thinking and ignores the individuality of students even though learning should promote individual rights. Some psychologists criticize constructivism because dominant students control interactions in the classroom while average students might be ignored (Gupta, 2011). These critics contend that the dominant group drives the whole class towards their thinking while leaving other students behind. Again this concept of group or social learning does not imply that the group makes a general

conclusion, one think to be clarified here is that, learning starts within the individual learner's head, then shared to other learners in the group, so this does not limit other people's thinking or knowledge creation. The advantage of social constructivism here is that, it gives each learner in the group the opportunity to think independently before making a contribution to the group, unlike in the teacher-centered approach where a number of individual learners' views are always ignored or left out in the interest of time and the nature of teaching.

Theoretical Gaps

The theory of social constructivism puts a lot of emphasis on learner construction of knowledge through social interactions. According to this theory, social worlds develop out of individuals' interactions with their culture and society. Knowledge evolves through the process of social negotiation and evaluation of the viability of individual understanding. Basically, every conversation or encounter between two or more people presents an opportunity for new knowledge to be obtained, or present knowledge expanded. The exchange of ideas that goes along with human contact is at play here. Jafari and Hanieh (2015) indicate that, social constructivism represents knowledge as a human product that is socially and culturally constructed. The point here is about knowledge production, and these researchers are not biased in terms of learner or teacher, in education systems, teachers are also students because learning or knowledge construction has no boundary, so the teachers are also learners and the learners can also facilitate a learning process through social interaction. A number of studies have looked at social constructivism as a theory which promotes learner-centered approach from a very small perspective, where they tend to only consider the product or destination minus the journey or process. Researchers like; Gordon, 2009b; Baviskar, Hartle, & Whitney, 2009; Beck and Kosnik, 2006; Alexander, 2008; Orlando, 2013; Rodriguez, 2014; Bahufite, 2017); Kaur, 2017; and many more. All these researchers look at social constructivism as a theory that supports learning of the learner through social interactions, but not learning of the teacher.

Most of the past studies were more on the learner generating new knowledge resulting from experience with other people, so the interactions were majorly between the learner and learner or the learner and a more knowledgeable person who could be a teacher. In their explanations, the theory does not look at teachers as people who can also learn something new from one another as a result of social interactions, which means, these researchers interpret the same theory using traditional teaching approach, in that it looks at the teacher in the image of master, an expert of knowledge, despite the fact that, they highlight the teacher as a facilitator of the learning process. These researchers seem to believe that social constructivism looks at knowledge generation as a result of possible interaction and discourses between and among learners. Its emphasis is on various roles of a learner such as active learner, social learner and creative learner.

Researchers further argued that learning is a social construction which means we make meaning of knowledge only through interaction with others. Moreover, constructivists believe that knowledge can be created and recreated which demands active involvement of the learners to discover new knowledge (Pritchard &Woollard, 2010). So, the whole idea is about learning of the learner through interaction, whereas this same process can be replicated to see teacher trainers and trainees generating new technology skills and knowledge through social interactions. Because we need to see this other party (individual teacher) preparing the teaching process in a learner-centered approach, which requires application of new technologies, so that in the end we can realize the demand for special digital skills and knowledge.

So, social constructivism does not only stop at learners generating new knowledge from social interactions, but rather also teachers as well as their learners (the teacher trainees) generate new understanding or gain some additional knowledge and skills from the social interactions between: teacher, learner and content facilitated by certain information technology. The researcher acknowledges that, since it is highly proven that social interactions promote new knowledge and skills of learners, the same framework can cultivate teacher-educators' and trainees' technology

knowledge and skills in the same process of social interactions, where a more knowledgeable user such as a lecturer interacts with a low level ICT user who in this sense may be a teacher trainee or fellow teacher trainer. Hence, this study was set out to establish the extent to which the theory of social constructivism can be used to cultivate or promote digital competences of both teacher trainers and trainees at the University. In this sense, there is re-conceptualization of a learner, whereby the teacher trainer/lecturer and even the teacher trainee is regarded as a leaner under the social constructivist approach**.**

Marone (2016) establishes the benefits of using technology tools in a constructionist setting and points out "Designing and sharing a digital artifact which means making a personal investment in the project, taking decisions throughout the process, and evaluating the progress and outcome, both on an individual and social level, seeking feedback from peers and more knowledgeable others" (Marone, 2016, p. 6). This is in support of the teacher, not necessarily the learner, teacher educators and trainees have a major advantage poised by social constructivism, however, very often several researchers do not bring out this component and a lot of emphasis has been always put on to the learner as an agent of the theory who benefits from the interactions. As teacher trainers, we utilize constructivist-based instructional strategies of social and cultural processes to provide our students with the technological resources and enable them to participate in problem-based learning activities. Along the same line of social constructivism, teacher trainers as well as trainees gain new technology knowledge and skills from the more knowledgeable users who in this case may be fellow teachers/lecturers or fellow trainees/student teachers whom we share with our learning activities.

When we talk of ZPD and suggest that, with the help of an instructor, students are able to understand and master knowledge and skills that they would not be able to on their own (Schreiber & Valle, 2013). This same principle is very applicable to the effort of transmitting technology skills and knowledge to the teacher educators and trainees. Teacher trainers who may lack some

technology skills and knowledge in the same way can make of use fellow staff in the School/ Department or discipline who are more knowledgeable technology users through usual interactions and in the end we anticipate improvement. Take an example of the, International Society for Technology in Education (ISTE) (2018) standard number 2B, which states that teachers must "develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress". This is a wakeup call to teacher trainers and trainees however; to meet such a requirement means changing from traditional delivery mode to a more learner-centered approach, an approach which is technology-based, an approach which allows learners to be active participants in knowledge building. It then becomes a requirement for teacher trainees to adopt technological skills and knowledge if we are to promote student-centered pedagogy, and the researcher was more interested in seeing how the social constructivism, use of social interactions to enhance the required technology skills and knowledge. Online social interactions for example, provide both teachers and learners with an opportunity of developing complex ideas such as; using a variety of digital objects for easy visualizations, models or simulations which can be used to simply certain learning themes and concepts in a given subject.

In order to apply social constructivism theory in teaching, teachers and school leaders need to shift and reshape their perspectives, both must move from being "people who teach" to being "facilitators of learning." When it comes to technology skills and knowledge, then the teachers also become learners along the same line and principle of social interactions, when a more knowledgeable teacher interacts with a novice technology user, the end result is technology skills and knowledge acquisition. So, the theory did not provide the practical approach of promoting these social interactions, and thus the study sought to address this by using an intervention based on Kurt Lewin's interpretive action design. Social constructivism teaches that all knowledge develops as a result of social interaction and language use, and is therefore a shared, rather than an

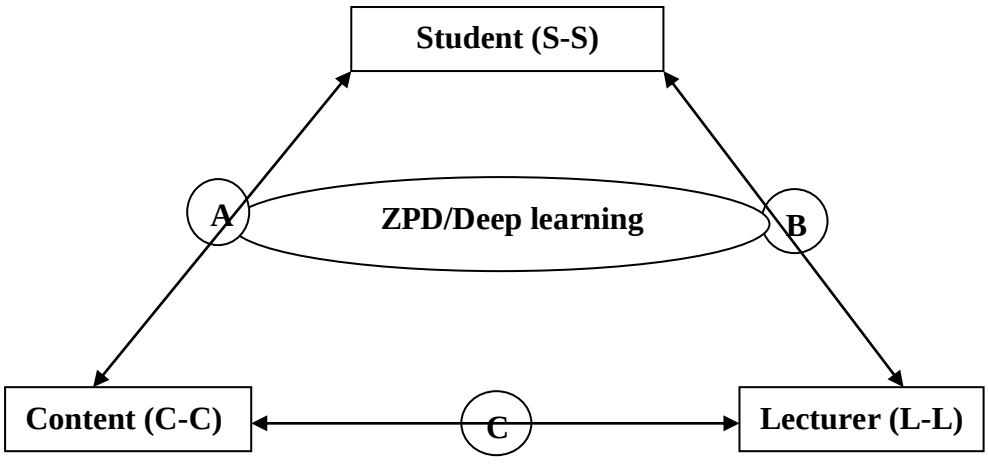
individual, experience. Knowledge is additionally not a result of observing the world; it results from many social processes and interactions.

We therefore find that social constructivist learning attaches as much meaning to the process of learning as it does to the acquisition of new knowledge. In other words, the journey is just as important as the destination which involves both the teachers and learners, not one sided. The learning process is not one sided and therefore, emphasis must also be put on the process not merely destination. By process, I look at what the teacher educator goes through to cultivate a favorable learner-centered environment, it is not a straight path and therefore, in the same line, social constructivism must guide teacher trainers to attain the necessary technology skills and knowledge which facilitate the learning/teaching process. In the same way learners construct knowledge through the social interactions, and since there is no doubt that information and Communication technologies are at the forefront of facilitating social interactions through both synchronous and asynchronous communication between teachers and students, teacher trainers as well as trainees generate new technology knowledge and skills resulting from the same social interactions.

Theoretical Framework

Social constructivism tries to point out that knowledge construction is as a result of social interaction, in this case, it is an interplay between; student, lecturer and content.

Figure 2.1: This framework is adopted from Vygotsky (1978)



This framework depicts a learning process which is resulting from sharing of experience and using the available content and technology tools to facilitate the interactions in a social constructivist perspective. Under social constructivist approach, learning is looked at as a social process which involves both the learner and the teacher (lecturer) interacting with the content. Vygotsky (1978) pointed at the external changes that occur as a result of social interaction, where both the learner and teacher share something, where both parties benefit something in the interaction process. Vygotsky, (1978, p. 33) describes deep learning as involving; creativity, communication, and collaboration which he refers to as; the zone of proximal development (ZPD). By Zone of Proximal Development Vygotsky meant, the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers. In other words, this is the gap between what a learner has already mastered or can grasp individually (the actual level of development) and what the learner can achieve when provided with educational support from a more knowledgeable person (e.g. a lecturer) during an interactive process. It refers to the knowledge and skills that a person cannot yet understand or perform on their own yet but capable of learning with guidance from a more knowledgeable person.

What Vygotsky refers to as meaningful learning is learning which promotes development. And according to Vygotsky, development is explained at two levels: "actual developmental level," which implies to what learners understand or can do without assistance from someone with more knowledge or expertise; and the "zone of proximal development" (ZPD), refers to what the learner grasps or can do with guidance from a more knowledgeable other. So, Zone of proximal development is a concept related to providing learners with deeper understanding of concepts for easy application, is about providing all possible approaches with an aim of creating meaningful learning other than cramming ;of concepts. Zone of proximal development is like "*scaffolding*", a

term which refers to a variety of instructional techniques used to move students progressively from weaker levels toward stronger understanding and, ultimately, greater independence in the learning process. Speth, Namuth and Lee (2007) indicate that, deep learning approach gives students autonomy in learning and offers good pace, ground, real-life illustrations, tutors being enthusiastic and offering lively and striking explanations to students. Westbrook et al. (2013) emphasize that pedagogic practices consistent with social constructivist approaches prioritize student-teacher or student-student interactions.

What is learning interaction?

Interaction is "a bilateral developed action which necessitates at least two objects and two actions. Whereas, social interaction can be referred to as; the interaction between the people. According to Anderson (2004), The significance of interaction in itself is that it is the vital link between the means and the ends in other words, interaction is vital to achieve the end goals and the means can either inhibit or promote interaction among students. In terms of the framework Communication Mode, Managing Contents and accessibility all have direct impacts on interaction. In fact, various communication modes encourage interaction especially the timeline; this supports the notion "that the greatest affordance of the Web for educational use is the profound and multifaceted increase in communication and interaction capability". So, interaction can be between people, objects or even actions, for example in Figure 2.1, we have the following categories of interaction; student and content (A); student and lecturer (B); lecturer and content (C); student and student (S-S); content and content (C-C) then lecturer and lecturer (L-L).

Lecturer-Student interaction

The importance of the interaction between lecturer and students has been so importance and also very effective in distance education. If a high-quality interaction between the lecturer and students is desired, it can only be ensured by a correct choice of the learning activities developed as part of teaching program and a proper teaching design.

Student-Student interaction

Communication enabled by computer increases the interaction between one another and it also facilitates the collaborative learning.

Student-Content interaction

Students spend a great deal of time engaging in pedagogical content especially at universities where students are considered mature learners. Current technology such as Google classroom facilitates to present this content provided by the lecturer.

Lecturer-Content interaction

The current technology gives the opportunity of preparing learning objects and integrating them into the courses to teaching staff. Teaching staff can; interact with the content through adaptable search engine, so he/she can interact with the teaching staff that will study or has studied on the same subjects. In this case, the role of this interaction focuses on the process of teaching design.

Content-Content interaction

It can be described as the interaction of interdisciplinary learning objects by being benefited from the modern technology. This new generation content is to be programmed by renewing the other automatic data sources themselves and interacting with updating and the other contents in order to gain new abilities.

Lecturer-lecturer interaction

Under this interaction heading, sharing needs of teaching staff with one another in terms of both their own disciplines is emphasized because it encourages learning from one another. These interactions can be met through various forums or learning platforms or portals freely. Social Constructivism as a school of thought does not propose a particular pedagogy but rather describes how learning takes place and has a belief that learning is a social process where an individual constructs knowledge as a result of interacting with another person. Therefore, constructivism

encourages learner-centered pedagogy where it views the learner as a: negotiator, team member, active learner, reflective learner, collaborator and adaptive; then teacher as a: facilitator of knowledge, coach, model, developer of instruction, team member, co-learner and scaffolding whereas content should be in form of: videos, audio scripts, texts, projects, discussions, research and experimentation. Educational researchers such as; Hull & Nelson (2005) and Stone & Guitierrez (2007) have emphasized the use of digital technologies to mediate learning interactions in order to promote effective teaching and learning. On the other hand, social constructivism approach was categorized into; social processes which included: information sharing, active participation and information modification as well as cultural processes: individual processes such as; beliefs, feelings, attitude, disciplinary background and then institutional processes which included: leadership culture, policy guidelines, curriculum and structural facilities. Individual processes such as; beliefs, attitude, feelings and disciplinary background.

Vygotsky (1962) posits that learner construction of knowledge is the product of social interaction, interpretation and understanding learning is viewed as a process of active knowledge construction within and from social forms and processes. This is called social constructivist pedagogy, which outlines the major principles for teaching in a modern world of technology; focus on learning not performance, view learners as active co-constructors of meaning and knowledge, establish a teacher–pupil relationship built upon the idea of guidance not instruction, seek to engage learners in tasks seen as ends in themselves and consequently as having implicit worth and also promote assessment as an active process of uncovering and acknowledging shared understanding. If such principles are followed by the teacher trainers, then the future teacher will exhibit similar approached to train the new generation. Adams (2007) explains these constituencies of knowledge as follows;

Focus on learning not performance

A performance orientation teaching approach adopts an overly simplistic causal link between outcomes on standardized tests and the quality of pupil learning. In Uganda for example, many of our graduates passed well their examinations at different levels, however, they lack the survival skills and knowledge simply because during their education systems emphasis was on performance and not learning, studying to pass examinations is not a solution in this era of information technology. In turn, such beliefs can engender 'teaching to the test'; predictions about the form and content of exam papers are made and teaching methods subsequently skewed in an attempt to maximize marks. However, such orientations often leave teachers feeling frustrated and constrained, unable to satisfy their desire to be creative and take risks, seeking instead to operate via 'contingent pragmatism', that is, the adoption of survival techniques (Moore et al., 2002). In such cases teaching becomes compliant with central imperatives in an effort to secure a favourable standing within the education marketplace. Such target-driven orientations celebrate successful performance as indicated by favorable test results as the ultimate aim for education (Shepard, 2000; Willinsky, 2005). According to Adeyemi and Adeyinka (2003), a qualified and experienced teacher with expertise in a particular area was used to train the children to understand a range of knowledge and skills. Therefore, to become a teacher, one had to demonstrate an outstanding experience, which the community acknowledged and approved for teaching of children.

The education system today in Uganda, the measures of learner success used lead to an overemphasis on repetitive short-termism aimed at maximizing test performance. One notable outcome of this is a concentration on those pupils who are able to make a difference; those who are most likely to score a better grade at a certain level, for such pupils are seen as crucial in the attempt to extend further a school's league table position. Unfortunately, such views trap schools into a cycle of non-creativity; as institutions they are more akin to frightened organizations where

people work hard and try new initiatives but are discouraged from taking risks due to the pervasive climate of fear (Watkins, 1999, p. 74), in Adams (2007). Furthermore, such high-stakes accountability cultures teach students that externally driven rewards and punishment should be those which engender effort (Shepard, 2000). What is never asked is whether the measures used actually represent valid, worthwhile or meaningful outputs (Ball, 1999, p. 204). At the heart of these performativity orientations lies the need to ensure that pupils exhibit behaviours that can be credentialized (i.e. graded and celebrated) through anonymous, externally moderated marking procedures. Pressure thus exists to orient teaching as the most efficient way to get information from the teacher and into the minds of the students so that they might acquire the knowledge and skills required to perform well in line with the education system. The associated orientation of learning is one of knowledge reception by pupils from the teacher, via carefully constructed, teacher-centered activities designed to support correct acquisition and favourable demonstration. Learning unfortunately becomes lost within the morass of deliberation about input and output, in what has been called a 'black box' view (Ball, 1999) in Adams (2007).

Additionally, a performance orientation removes the locus of control from pupils; teachers become the focus for success. Such attributions, in addition to celebrating professional compliance, reorient learners as passive recipients, dependent on those around them for success, required to prove competence through successful performance. Although research suggests that pupils attribute success to a number of factors, a concern for improving one's performance is more likely to engender feelings of 'learned helplessness', whereupon difficulty is avoided, repetition favoured and ability doubted. Consequently, pupils cease to persevere in the face of difficulty (MacGilchrist, 2003). In an era of high-stakes accountability, effort is increasingly being articulated by its relationship with responses to externally administered rewards and punishments (Shepard, 2000). Conversely, a 'learning orientation' (Watkins, 2001) keeps the locus of control squarely with the pupil. Here, effort is seen to bring reward; an increase in

achievement as measured through personal progress against previous positions. In this orientation, learners describe themselves in terms of deepening understanding and derive satisfaction from perseverance and success in difficult tasks (Watkins, 2001). This orientation is supported by the social constructivist paradigm, which explicitly and implicitly acknowledges the contingent and fluctuating nature of learning. Social constructivism looks at a learner as the center of knowledge creation; learners build their own understanding of concepts guided by the teachers as long as there is free social interaction where learners are provided with challenging tasks to work on in their respective groups. This learning style is the modern way of teaching, where the focus is the learner but not the teacher, learner-centered approach, and so, teachers and school managers need to look into the new approach where teachers create environments to their learners which promote creative thinking and analysis other than enabling students to simply cram content in order to get good grades at a certain level, because these become seasonal thinkers, not providers of permanent problem solvers.

Learners are active co-constructors of meaning and knowledge

Implicit and therefore vital within social constructivist principles is the concept of mind. In contrast to the black box, behaviourist view of learning, social constructivism requires attention to learning as mindful activity; that is to say, as occurring in the mind. According to this theory, individual learners construct and acquire new ideas from others after assessing these ideas through dialogue (Baviskar et al., 2009). Accordingly, the ability to construct and assess knowledge depends on background experiences that facilitate the interpretation of new phenomena within a particular cultural setting of the individual learner. Beck and Kosnik (2006) contended that for a fruitful interpretation of the reality to occur, learners need to engage in a group discourse in which experiences are shared, as this would realize an authentic solution to problems. In this study, the researcher engaged learners in a rich discussion about certain themes in Economics (which is a subject of their specialization) and through these collaborative activities

where both students and the teacher would exchange views, it was revealed that knowledge construction is a result of team work.

Additionally, it readily incorporates social and cultural factors as essential to the formulation of understanding. Social constructivist theory emphasizes the role for others in the individual construction of knowledge (Vygotsky, 1978); learning, in this paradigm, is a primarily social process. Explicit here is the belief that individuals bring implicit theories and perspectives derived from the cultural background (Sutherland et al., 2004), and that inter-psychological aspects of knowledge creation themselves assist in the formulation of this very cultural context. Thus, whilst teachers have an important role in developing and arranging contrasts in order to stimulate discussion and thought, pupils are also so judged; the view that pupil learning is merely a reaction to culture is seen as untenable. Instead, social constructivist theory views learning as dual-agentic: learner and teacher engage to co-construct the socio-cultural realm; their decisions 'scaffold' each other. The discursive nature of social constructivist learning environments emphasizes the need for children to be given time to talk, with the teacher's role that of listener and observer. Indeed, Black and Wiliam (1998) in Adams (2007) conclude that collaborative discourse leads to opportunities to self-reflect, with concomitant gains in learning. What all this provides for are spaces and instances of and for active co-construction of meaning and understanding. The mutually reinforcing nature of open-ended, exploratory talk provides mechanisms and opportunities for individual reflexivity within a context that actively desires and operates to mediate knowledge construction into the social space.

Adams (2007) further points out that, the most obvious reform required then is the devising of more open-ended tasks that require students to think critically, solve complex problems and apply their knowledge in and to their own world (Shepard, 2000). However, the idea of co-construction should not be confined to teacher–pupil interaction alone. Behaviourist learning and teaching interactions often led to a culture of pupil dependence on teachers; pupils

did as they were told and had good surface understanding, but little sense of purpose (Weeden & Winter, 1999). To avoid such dependency, social constructivist approaches acknowledge the need for pupil–pupil interaction. Additionally, such approaches are useful in creating the 'common knowledge' that Easen and Bolden (2005, p. 55) maintain is required if pupils are to recontextualize the everyday, common-sense knowledge of the home, which thrives on naive or idiosyncratic theorizing, into the school environment, where formal theories and sense-making abound.

Teachers are learning guides not instructors

According to the behaviourists, the pedagogical paradigm is that classes should be dominated by teacher exposition, agreed texts and methods of instruction that best assist students in negotiating summative assessments designed to evaluate performance. This position does not necessarily preclude pupil involvement and discussion but ultimately the purpose and direction of interaction is preset. Rather than using debate and discussion as a means to elucidate and unpack personal ideas and theories, such activities become a means to an end whereby teachers highlight and correct 'misunderstandings' and 'inconsequential knowledge'. As a counterpoint, the social constructivist-oriented teacher is positioned as an organizer of information (Hanley, 1994; Crowther, 1997). Their role is as facilitator (Copley, 1992), working to provide students with opportunities and incentives to construct knowledge and understanding. In a practical sense, social constructivists focus thinking on activities that provide pupil-world, case-based learning to enable authentic, context-oriented, reflective practice within a collaborative and social environment (Jonassen, 1994; Rice & Wilson, 1999). Most contentiously, the constructivist environment advocates the gradual transference of power to give the learning agenda to the learner. In effect what is required is a paradigm shift: the abandonment of the familiar to embrace the new (Brooks & Brooks, 1993). However, social constructivism does not remove the need for the teacher; rather it redirects teacher activity towards the provision of a safe environment in

which student knowledge construction and social mediation are paramount. Such orientations require teachers to understand the requirements and stages through which students travel on their journey towards understanding, which in turn might successfully mediate into the socio-cultural space. In short, the process of scaffolding the learning journey is the key teacher requisite (Vygotsky, 1978).

Learners should be engaged in tasks seen as ends in themselves

Adams (2007) indicates that, there are two beliefs here: first, the teacher's role is fundamentally different from that lauded in the behaviourist paradigm, most specifically during teacher–pupil interaction at the point of celebrating learning. Unfortunately, all too often in primary education extrinsic reward provides the mainstay of motivational techniques. The use of such reward systems (e.g. stickers, smiley faces) can actually undermine interest and demotivate learners (Black & Wiliam, 1998); it does nothing to close the gap between learning and understanding how to do better. There is nothing in the reward or its conferral that gives the learner an understanding of intricate cognitive change; neither do they connect meaningfully with the learning process. Secondly, there is therefore a need to consider transference of control from teacher to pupil. The aforementioned problems with extrinsic reward systems denote a need to separate such rewards from the celebration of successful learning. Whereas behaviourist techniques for behaviour management at times may be both successful and necessary (even though such theories are predicated on particular views of the learner, teacher and indeed education, a discussion all of its own), their role in supporting pupil self-control for learning is at best minimal. Certainly, reward systems can and do achieve increases in the frequency and quality of pupil behaviour, including working with peers (Porter, 2000). However, mindful commitment is not required (Desforges, 1993, 1997); that is, a commitment to the learning in hand, due to purpose and a deep sense of self-awareness.

A sense of purpose and the way a task situates a pupil are that which provide meaning, meaning which in turn provides motivation. However, motivation in this sense should not be taken to simply mean feelings of intrinsic worth; rather it should signal that pupils can persist even when a real desire to intellectually engage is not present. Mindful commitment recognizes that interest alone is not enough to engender persistence (Silcock, 2003, p. 49). The above creates a new set of challenges. Although teachers cannot learn on behalf of the pupil, nor can they in all honesty make someone learn, they can do certain things to help. The idea of 'common knowledge' has been previously mentioned in relation to bridging the gap between the worlds of home and school (Easen & Bolden, 2005). This idea along with mindful commitment present an interesting opportunity to engage with social constructivist thinking.

The significance of socio-cultural issues offered as part of learning in the idea of 'common knowledge' sits neatly with the underlying basis for social constructivism. Providing pupil-world perspectives on learning situations not only makes school learning authentic but also turns the knowledge and skills gained back in on themselves. Research demonstrates (Bereiter, 2001) that school learning which connects to a learner's wider, personal agenda is more likely to transfer between home and school. Thus, by providing a socio-cultural context for tasks that is wider than school, those aspects of school learning that are transferable due to their occurring as part of the social setting become not only embedded in the processes of school learning, but also alter the cultural context of the classroom; in effect learning shapes school into something tangible rather than ephemeral and obscure.

Practically, these points draw attention to two aspects. First, when designing learning opportunities, the question needs to be asked: 'How is this meaningful for my students given their life-world?' So, teaching in this sense is not simply about performing well in class but rather developing a critical thinker, someone who can survive in all situations created by the environment, learning for life. The requirement to reflect on that which has been personally

constructed within the social world can only carry meaning if it can be related to personal reference points. When supporting pupils in their efforts to construct knowledge and meaning, opportunities must be provided that require the deconstruction of views within the social realm. Thus, rather than being asked what they think and why, learners must be encouraged to explain what they think, why, and how such changes seem to fit with the requirements of the socio-cultural context. Secondly, design of learning opportunities and methods for demonstrating and mediating knowledge into the socio-cultural space should rest at least partly with pupils. Asking pupils what they wish to consider and how they wish to investigate and present their work engenders feelings of importance and worthiness.

Assessment is an active process of uncovering

Traditionally, assessment, learning and teaching have been seen as three related but separate aspects of education (Graue, 1993) in Adams (2007). Moreover, teachers generally subordinate assessment to instruction not interaction (Torrance & Pryor, 1998). Such views echo the aforementioned behaviourist ideals: as learning (the act of acquisition) occurs sequentially and hierarchically, tests should be used to ensure mastery has been achieved. In this guise, learning is seen as synonymous with good grades which are, in turn, seen to be good forms of extrinsic motivation (Shepard, 2000). However, social constructivist perspectives require much more than a mere reorientation of the interrelationship between teaching, learning and assessment; at their heart they see the latter as embedded within the learning and teaching process. In our traditional teaching approaches, assessment is not aimed at helping learner where they have gone wrong, but instead teachers concentrate too much on marks and grades of learners rather than helping them where they have gone wrong. The Ministry of Education in Uganda, basing on reports from the National Assessment of Progress in Education (NAPE) findings of 2011 and 2015, has recommended teachers to carryout continuous assessment with an aim of ensuring that teachers' assessments are directed towards supporting learning but not teaching as the priority is in many

schools in Uganda today. Assessment should be based on obtaining a particular learning objective not a mere routine exercise that happens in schools today, whereby most schools especially at primary level do set beginning of term exams even for term one, and one wonders whether such assessments promote any learning at all.

Shepard (2000, p. 8) notes, 'good assessment tasks are interchangeable with good instructional tasks'. Assessment thus needs to be reconstructed from the means by which reward might be conferred to a source of insight and help for all involved in the learning and teaching interaction. Within a social constructivist perspective, assessment seeks to consider how and why pupil positions do not successfully mediate into the social domain; that is, how and why pupil responses do not 'fit' with current socially agreed interpretations. In support, contemporary assessment theory identifies a number of factors more likely to both develop the quality of pupil learning and reinforce the view that assessment, as distinct from testing, is an aspect of the learning and teaching process rather than an adjunct. Social constructivism offers suitable insights into describing and constructing theories and processes.

The inter-psychological basis for knowledge construction requires a dynamic learner–teacher interaction and provides possible insights into three assessment issues. In the first case, drawing on Vygotsky's theory of the Zone of Proximal Development (ZPD) (the difference between that which a learner can do independently and that which can be achieved with the support of a more significant other), whilst it should be obvious that support from a significant other provides rich opportunities for teaching. Specifically, by providing assistance during teaching episodes which are in themselves viewed as assessment opportunities, teachers not only teach, they gain insights into what has been constructed and how this might be extended and modified. The social constructivist view of knowledge as constructed inter-psychologically creates a forum for dynamic and ongoing development. Moreover, the ZPD opens up possibilities for peer assessment, whereby pupil communities of practice provide opportunities for and

requirements to share thought processes. Such ways of drawing on the distributed expertise of all in the class (Sutherland et al., 2004) offer rich learning opportunities.

Secondly, the conversational requirement of inter-psychological knowledge creation utilizes pupils' implicit theories and perspectives as the basis upon which further learning is to be built. 'Instructional conversations' as interactive, dialogic enterprises, uncover that which has remained fully or partially hidden so that constructed ideas and beliefs might be pondered for complexity, meaning and implication. Assessment in such forms provides a standard upon which those engaged in dialogue might agree on that which successfully predicts and that which requires further development and thought. Thirdly, and following on from the above two points, simply assigning to assessment the role of the attribution of right and wrong requires the identification and correction of student errors. Conversely, assessment as learning and teaching provides a number of opportunities for feedback and 'feeding forward'. In this vein, errors might be ignored when inconsequential by offering hints or asking leading questions. The teacher provides support and guidance at the same time as diagnosing student interpretation to inform and direct further action. Practically, divergent assessment is non-judgmental, yields insights into understanding and prompts meta-cognition. More importantly, it recognizes the need to involve pupils in self- and peer assessment through the use of discursive and collaborative learning and teaching strategies.

Review of the Related Literature

Digital competence is a new concept describing technology-related skills and knowledge for teacher trainers and trainees. Today, a number of terms have been used to describe digital competence, such as: ICT skills, technology skills, information technology skills, 21st century skills, information literacy, digital literacy, and digital skills. Digital competence is the ability to keep abreast with the rapid changes in the area of ICT. It comprises the related knowledge and skills you need to exploit ICT efficiently for your own purposes, be it for your personal or professional life. Digital competence as a key variable for this study has been reviewed by

different authors to show its impact on teaching and learning in the 21st century. This digital competence concept has been looked at in line with the social constructivist approach by Vygotsky. This literature review section tries to address the gaps in using social constructivist approach in order to cultivate teacher educators' digital competence in teaching, and so, the following sub themes have been addressed as below;

Teacher-educators' and teacher trainees' technology knowledge using social processes

Social processes such as: information sharing, active participation, negotiation and modification are part of the major components of the social constructivist theory which promote deep learning through the use of ICT tools. In the due course where learners and trainers interact to generate new knowledge, they find themselves in need of tools or devices which support their activities (teaching and learning), and some of these tools that can be borrowed to support this process are ICT-related. So it is anticipated that social processes promotes technology knowledge to support teacher trainers' teaching practices if well utilized. Technology knowledge according to Koehler & Mishra (2009) means the ways of thinking about and working with technology, tools and resources; understanding information technology broadly enough to apply it productively at work and in everyday life; being able to recognize when information technology can assist or impede the achievement of a goal; and having the ability to adapt to changes in information technology. Technological knowledge also refers to the information and ideas in one's head on how to operate systems and computer hardware, as well as the ability to use standard software tools (Mishra & Koehler, 2008, p.4). Technology knowledge means ability to understand how to teach or learn with ICT where ICT is used to supplement normal teaching processes and resources. It involves stepping into a culture and mindset that supports the practice of using ICT for educational purposes, regardless of one's level of expertise. Information Technology is intended to support new ways of teaching and learning, not simply as an

educational extra, but as an effective means to support curriculum delivery and achieve educational outcomes, and so this process requires an individual's ability to think critically well how best to do this.

Hughes (2005) classifies technology-knowledge into three categories: (a) replacement (b) amplification (c) transformation. He argues that, technology as replacement involves technology serving as a different means to the same instructional goal. For example, a teacher could type a poem on a PowerPoint slide and projects it to the learners. This activity replaces the writing of the poem on a poster and taping it on to the wall with the unchanged instructional goal for students to read the poem. Technology as amplification involves the use of technology to accomplish tasks more efficiently and effectively without altering the task. For example, a teacher may ask students to edit peers' stories typed in a word processor. Using technology as a transformation tool has the potential to provide innovative educational opportunities by reorganizing students' cognitive processes and problem-solving activities, but it must be noted that, technology knowledge alone does not suffice ICT integration in teaching and learning, and for researchers like; Mishra & Koehler (2006) recommend that, technology knowledge should be combined with; pedagogy and content knowledge which is derived from the (TPACK) approach. This approach addresses the most important sets of knowledge teacher educators would need to make full integration of ICT into teaching. On the other hand, TPACK approach creates a connection between technology, pedagogy and content knowledge.

Mishra & Koehler (2006, p. 1029) continues to emphasize that it is not sufficient for teacher educators to be knowledgeable about technology or quality pedagogy, in the absence of knowledge related to how this form of technology is related to the intended content. The essence is; the central construct of TPACK is not merely a straightforward combination of technology knowledge, pedagogy and content, but rather an emergent form of transformative knowledge that truly integrates ICT components into new forms of educational technology in the classroom.

Again TPACK does not make a critical emphasis on social interactions, whereas in actual sense the interconnection between technology, pedagogy and content involves interaction, and then the question would be what the outcome is of: technology, pedagogy and content knowledge? Mishra and Koehler (2006) argues that, TPACK results into a new framework for technology integration in the curriculum, but this itself is already pedagogy, it is like saying pedagogy is a component of itself, because pedagogy is the method and practice of teaching especially an academic subject or curriculum, technology integration in teaching is a pedagogical approach in itself. The current study tried to redress pedagogical amplification using technology knowledge, which then requires an interaction of; teacher, learner and content. These social interactions talked about in the study are trying to strengthen pedagogy, and the researcher emphasizes that, as individuals interact in a group, they develop new knowledge of using these technologies, and thus promoting new pedagogical approaches. In this study, pedagogy is not considered a variable on its own, but rather it is an outcome of the individual social interactions process. This implies that, teacher trainers and trainees, who get involved in social interactions through ICT, they gain some technology knowledge in the process and this helps them to further their collaborative activities.

There is basic ICT knowledge required under the paradigm shift, so advancing from traditional pedagogy to the 21st century teaching which emphasizes learner-centered paradigm has particular demands and needs, but at least one of them is making learners active and that is one reason we are talking about ICTs as catalyst for learner-centered approach because through the use of ICT devices and programs to learn forces learners to be engaged with the devices and the learning tasks. Accordingly, Gulbahar and Guven, (2008) show that, some of the technology knowledge that may result from learner or individual interaction include; research and content analysis which are so fundamental in preparing the course materials on the side of the teacher trainer, but also the learners especially when handing a given study task which requires exploration. These researchers however observed that, very often there a big mismatch between

ICT and curriculum, an implication that, course design and development at times are not aligned to technology integration and thus limiting acquisition of technology knowledge requirements. This means that, courses must have tasks that prompt learners do research, nor get into situation of analysis where the learner has to pick or make a critical learning decision on the given study task or materials which most especially when it is in a project form. In the same line, according to Cennamo, Ross and Ertmer (2010, p.10), to achieve technology integration that targets student learning, lecturers need particular technology knowledge that enables them to: identify which particular technological tools are needed to support specific curricular goals; specify how the tools will be used to help students meet and demonstrate those goals; enable students to use appropriate technologies in all phases of the learning including exploration, analysis and production and also to select and use appropriate technologies to address needs, solve problems and resolve issues related to their own professional practice and growth. It therefore implies that, when we are planning to integrate ICT in teaching, the course design and development must clearly indicate which item in the course requires which type of ICT to either deliver or assess it, and in the end this will guide both the teacher and learner to determine which ICT knowledge is required to manage a given course unit.

In my opinion, the TPACK framework which has been used as a guide to effective technology integration has not been fully utilized by many schools which offer professional development and those who design technology-based courses at teacher preparation programs because it has gaps in articulating which particular technology knowledge should be embedded in the curriculum. This is where we need to correct and so, this study anticipated that the best approach of gaining digital competence is through social interactions where; learners, teachers and content do interact, in the process certain technology knowledge will be acquired since there is practical exposure of a given technology facility which manipulates the interactivity. This study has a lens which supports the idea that, instead of organizing workshops which very often are

divorced from the robust education technology theories, we can encourage teacher trainers and trainees to embrace social interactions through different platforms which promote the attainment of new technology knowledge from more informed or knowledgeable users within our Departments or Units. There are quite many online learning platforms such as; Blackboard, Moodle, Google classroom, zoom, simple VLE, Lynda, Alison, courser, etc. But there are also some social media platforms such; face book, whats app, YouTube, messenger, wechat, instagram, tumblr, Qzone, Tik Tok, twitter, baidu tieba, linkedin, viber, snapchat, pinterest, telegram, etc, some of which can be used for learning purposes, although with a lot of caution.

Researchers like Shuva (2010) revealed that, educational systems around the globe are all becoming increasingly pressured to apply the new ICT tools to their curriculum to provide students with technology knowledge needed in the 21st century. This is because, in today's world of employment, technology knowledge has become very pertinent and almost compulsory especially in teaching, due to the fact that, we are dealing with digital natives who can hardly study in a traditional style. Blended learning and teaching is becoming a global concern, putting it into mind that, teachers are human beings, who may even become sick or incapacitated to go for work, the world we operate under is full of a number of natural calamities especially in the developing countries like Uganda where the teacher has a number of other social obligations especially looking after family. But again there may be some other unavoidable cases such as; political insurgency, weather changes, pandemics, etc which may make live classroom interaction impossible, whereas with blended teaching or learning approach the curriculum delivery continues with help of information technology and in some cases teachers can even do live chats with their learners such as using the Zoom meeting platform which can accommodate more than five hundred users at ago. So with these new teaching technologies, teachers as well as learners do not need that specialized ICT training, but rather they learn by doing through social

interactions, good enough there is wide availability of these ICTs (devices and programs) now even in developing countries.

Plowman et al. (2010) from their UK based study found out that, almost all children aged three and four are growing up in homes which have a range of different technologies. They found that 98% of their survey respondents' children were living in a household with access to a mobile phone and 75% had access to a television with interactive features (p. 308). Their study further indicated that, most of the children surveyed also had access to laptops, games consoles, handheld games, laptops and interactive books (p. 308). In addition to this, "all children encountered a wide range of leisure technologies, such as television and DVD players, as well as cameras and MP3 players". Take an example, the way our children are familiar with some social media platforms such as face book and whats app is a great example to show that, such technology knowledge is a matter of interaction between: the learner, content and perhaps a more knowledgeable user through a given technology. Many teacher educators have failed to adopt ICTs in teaching simply because of minor excuses such as; infrastructure and time, but the same people are often on social media platforms, which means it is a matter of re-orienting ourselves as educators to style up and get onboard and also should know that today's learners complain whenever we fail to teach them through ICTs.

Angeli & Valanides (2009) advises teachers that, relevant ICT integration knowledge depends on a consideration of the interactions among the student, teachers and content. So, this integration requires both lecturers and students to understand: (a) the technology tools themselves, combined with (b) the specific affordances of each tool, in that when used to teach content, it enables difficult concepts to be learned more readily, thus resulting into deep learning. But also, Cennamo, Ross and Ertmer (2010, p.10) propose that, to achieve technology integration that targets student learning, lecturers need particular technology knowledge that enables them to: identify which particular technological tools are needed to support specific curricular goals;

specify how the tools will be used to help students meet and demonstrate those goals; enable students to use appropriate technologies in all phases of the learning including exploration, analysis and production and also to select and use appropriate technologies to address needs, solve problems and resolve issues related to their own professional practice and growth.

Teaching with ICT is not all about being able to type and save files but rather to have the potential knowledge of integrating the available ICTs in teaching and learning. This means that, teachers together with their learners must possess some knowledge to conduct lessons in situations where they cannot meet in a live classroom instruction. In the same perspective, Shuva (2010) observes that the challenge with most of the educational systems around the world including Uganda is how to transform the curriculum and teaching-learning process to provide students with the requisite knowledge to function effectively in a dynamically and continuously changing environment. ICT provides powerful tools that may help in transforming the present isolated, teacher-centered, and text-bound classrooms into rich, student-focused interactive knowledge environments. To meet these challenges, learning institutions and schools need to incorporate the new technology approaches in the curriculum or else teaching the new generation will be more complicated because they are used to discovery learning approach, they learn through interactions with technology and people. Lawless and Pellegrino (2007, p. 580) also assert that, lecturers need technology knowledge if they are going to prepare their students to be technologically capable.

According to Jaiswal (2011), the teacher education system empowered by ICT-knowledge can have a great opportunity to come up to the centre stage and ensure academic excellence, quality instruction and leadership in a knowledge-based society. This era of pervasive technology has significant implications for higher education. Technology allows students to become much more engaged in constructing their own knowledge. Most especially on the side of teacher trainers and trainees, technology knowledge empowers them to create new learning environments

that are learner-centered, a context where learners are tasked to create meaning through interactive environments. When learners are given a chance to interact with each other or content, they develop reasoning and a sense of maturity, very often today especially at lower levels of the education systems i.e. primary and secondary education, learners are used to getting each and everything from their teachers which leads to low levels of learner involvement and rot learning. Vajargah, Jahani and Azadmanesh (2010), also found out that technology knowledge can be used to support teaching and learning as well as research activities including collaborative learning and inquiring. These researchers further say that, teaching is an ever-changing profession and that the field of education is expanding each year as advancement is made in technology and brain based research, therefore to keep pace with the changing world, teachers and teacher trainers must have current technology knowledge.

Elizabeth (2010) advised that a teacher should know about technology, pedagogy and content for using them effectively in day-to-day classroom teaching, because ICT is a motivating factor to learning and promotes the acquisition of new knowledge since learners' interaction with both content and other learning partners is global when there are internet services. So, the teacher trainers and trainees both equally need to possess digital knowledge if they are to compete at an international level and if their teaching is to fit into the 21st century where learners are considered as digital natives. It must be noted that, traditional methods of teaching cannot develop effective foundation for critical thinking and understanding for the digital native learners. Students learn more when learning becomes personal (constructivist approach) where learners are given interactive tasks to work in a collaborative way using Information Communication Technology tools and hence this fosters their ability to acquire technology knowledge. Through ICT, the learners would be able to construct their own concept and find their own solutions to their problems. Research further indicates that, there are differences in technology knowledge between teachers and students. In this way, Orlando and Attard (2016) reported that teachers' technology

Knowledge on how to integrate technology in the classroom was found to be low whereas during the digital story telling activities, students exhibited fair knowledge on how to interact with their counterparts using different ICTs and this could be attributed to the fact that today's learners are digital natives, they have been born when these technologies are on a high rise, so they find it much easier to learn by doing. The technology knowledge possessed by the teachers helped them to prepare more motivating lessons with adequate resources, considering also the affordances of multimodal activity that could be beneficial in reaching the digitally native students.

Unfortunately, many teacher educators at Makerere University have not been exposed to transformative technology-supported pedagogy because professional development activities have focused primarily on how to operate information technology tools, but not ICT integration. It is clear that, teacher educators will never have full knowledge about the tools available, as they are always in a state of technology flux. The situation at Makerere University has been always to attempt using different technologies but full utilization of these technologies has not been reached. This has often resulted into a situation where lecturers are being perpetual novices in the process of technology integration as observed by Mueller et al., (2008), and therefore this suggests that there is a need to cultivate teacher-educators' self-efficacy for teaching with technology through reconstruction and redefining technology knowledge which includes; Collaboration, content analysis, civic Literacy, distributed cognition, media Literacy and collective intelligence. Many teacher educators at Makerere University have not been exposed to transformative technology-supported pedagogy because professional development activities have focused primarily on how to operate the technology, but not how to integrate it into teaching. It is clear that, teacher educators will never have full knowledge about the tools available, as they are always in a state of technology flux. The situation at Makerere University has been always to attempt using different technologies but full utilization of these technologies has not been realized and the question has been always on approach. This has often resulted into a situation where

lecturers are being perpetual novices in the process of technology integration as observed by Mueller et al., (2008), and therefore this suggests that there is a need to cultivate teacher-educators' self-efficacy for teaching with technology through reconstruction and redefining technology knowledge which includes; collaboration, content analysis, media literacy, distributed cognition, and collective intelligence.

Teacher-educators' and teacher trainees' technology skills using social processes

In the first case, by skill here we are talking about the "do", "action", it is the ability to do something well, so skill here is an active word, teacher trainer's and trainee's ability to perform a task practically using ICT. Information and Communication Technology skills basically refer to learning about ICT by exploring what can be done practically using ICT tools and programs. Technology skills include the ability to exploit the opportunities offered by ICT and use them critically and innovatively in education and work. Use of digital tools is a skill the individual must acquire, maintain and continually develop if he or she is to be a technologically skilled and critical (Norwegian Ministry of Modernization 2009, p.8). Social constructivism focuses on social processes to indicate that, to develop a skill, the individuals need to see the need for sharing information, why and how active participation is facilitated, and role of negotiations or discussions in teaching and learning and also the purpose of modification of information. These social processes (information sharing, active participation, negotiation and modification) are not naturally learnt but require some effort from both the teachers and learners to adopt certain technologies. According to Jegede (2009) computer aided instruction happens to be one of the most required skills for a classroom practitioner but instead it is the least possessed by teachers today. Much as this could have been as a result of so many factors but one of them is lack of technology skills in teaching and learning. Whereas there is now great need of shifting from "Learning to use ICT" to "Using ICT to Learn or teach", teacher educators at Makerere

University have not taken lead in this; they have not engaged learners with digital technologies for learning purposes as had been earlier on proposed in the 2011/12-2018/19 strategic plan.

Research has continued to indicate that, teachers who use technology frequently to support learning in their classrooms report greater benefits to student learning, engagement and skills from technology than teachers who spend less time using technology to support learning (Richard W., 2010). In fact Ajayi, Salawu & Adeoye (2008) warned that, teachers without ICT skills are gone; any classroom teacher with adequate and professional skills in ICT utilization will definitely have his or her students perform better as a result of continuous information sharing, active participation, negotiations and knowledge modification. It must also be noted that, teaching and learning has gone beyond the teacher standing in front of students and disseminating information to them without the students' adequate participation and interaction. Other researchers like; (Cavas et al., 2009; Tezci, 2009; Drent and Meelisen, 2008) have continued to show that there are significant positive relationships between teachers' ICT skills and frequency of ICT use. However, Laurillard (2013) indicates that, even if teachers and students use technology, this does not necessarily mean that they can teach or learn with it. Because using technology to learn does not come naturally to everyone, digital skills should not be treated as independent of context (Young, 2012), but both teachers and students should be exposed to technology skills applicable across the curriculum (Collin & Karsenti, 2013). Even, Mishra and Koehler (2006) revealed that, the application of technology skills in teaching and learning is not context free; yet professional development centered on isolated technology skills has been prevalent in most institutions especially in developing countries. Technology skills learned in isolation may even have a negative impact on an instructor's ability to see the complex application of that technology in a pedagogical and contextual nature, so in teacher training, technology should be integrated with content teaching otherwise it loses meaning.

Other scholars have expressed concern that pedagogies for online education may be ineffective because they are not necessarily designed from the perspective of the learner (Laurillard, 2013; Prensky, 2003), and they caution that digital literacy is not simply about skills and competencies but about frame of mind (DeSchryver, Leahy, Koehler, & Wolf, 2013). What is required of the teacher trainers is to design content in such a way that it allows students adopt digital technologies to solve a given learning task. For example, if students are given a poem and they are told to modify it in groups (collaboratively) and then post it to a given learning platform such as MUELE for further discussion. Such a process allows learners to gain digital skills and also helps them to socially interact to create meaningful learning. A classification of computer-based ICT skills for developing countries are suggested by Akoojee, Arends and Roodt (2008) as being: a) lower level skills- under which occupations require considerable ICT know-how and, therefore, are not excluded from the intermediate level; b) intermediate-level skills- include those who rely either exclusively or reasonably extensively on computer technology for the successful accomplishment of their core function and c) higher level skills- occupations are characterized by the specialist nature of ICT work associated with software and hardware development. Teacher educators should have been at intermediate level, although there are those who can even reach a level of designing and developing teaching materials (higher level skills).

Beena and Mathur (2012) found out that the role of ICT in transforming teaching and learning seeks to explore the awareness of teacher educators about use of information and communication technology for effective teaching learning process and how this will impact on the way programs will be offered and delivered in the teacher training institutions. Teacher education programs can facilitate improvements not only in students' technology skills but also in their beliefs and intentions regarding integrating technology into instruction. Technology training directly affects pre-service teachers' self-efficacy and value beliefs, which in turn influence their student-centered technology use. New technologies have provided new possibilities for the

teaching profession. However, teacher educators and teacher trainees in Uganda and many Institutions in developing countries especially in Africa have not yet mastered these new technologies in the classroom situations. Research indicates that, through social interactions teachers gain technology skills for information management to enhance their teaching practices, but teachers only used a few digital resources mostly projectors and computers, where the 'traditional' teaching and learning methods were applied (Al-qallaf and Al-mutairi 2016). However, the same results indicate that, students lacked the digital skills to assess information, take notes and synthesize the information. The same study further indicates that, the way teachers interacted with the students when giving instructions and asking questions with technology, influenced the students' understanding of new concepts and encouraged more collaborative inquiry which in the end also promoted students' digital skills. This implies that, technology skills are more applicable and easily developed while undertaking project-based learning activities, assigning learners a task for their own investigation, but it does not sound an obvious process, so it requires collaborative inquiry that leads to cooperative learning and in the end learners gain technology skills such as; ***network management skills, communication, information management, content creation*** *and* ***problem solving*** which support their learning interactions.

Communication skills

Communication is an important technology skill which both teachers and learners need if they are to work correctly with ICT in teaching and learning. According to Tondeur, Forkosh, Prestridge, & Edirisinghe (2016), when the teachers communicated and shared their teaching material, they felt confident and secure since their innovative approaches were accepted. Teachers gain a lot of courage when they share their work and also give timely feedback to their students. These researchers considered teachers' communication and working together with students as a requirement for quality teacher training today. Communicating with the students' offers a great opportunity for teachers, to better design lessons tailored to students' needs and activities initiated

at school. This interest will foster more sharing between students' different backgrounds and more inclusion especially where there is a language barrier. Teacher training in this digital communication world is very useful since it allows learners to construct new knowledge, reflect on the process and receive feedback. Through reflection, teachers could critically examine their work, understand new conceptions of constructivist teaching and learning, and accept new roles of teaching from an instructive to a more constructive approach (Tondeur et al. 2016).

Problem solving skills

Several studies indicated how teachers could make use of various digital activities to encourage problem solving; some of the mentioned activities were computer simulations, scenarios, blogs and inquiry activities (Al-Qallaf and Al-Mutairi 2016; Tondeur et al. 2016). Gaining technology skills in problem solving is beneficial since students are already familiar with simulations through digital games which they usually access on their smart phones or laptops from the internet may encourage learning. First of all, the student aims at solving a problem during the game play or simulations. Training pre-service teachers to solve problems with technology ensures better skilled teachers with the right attitudes to develop the curriculum later on in their profession. Since technology is continuously evolving, training with new tools must continuously be provided and this is quite challenging for the teachers, as they need to continuously adapt their teaching to new digital tools. Teachers need to have the disposition to experiment with new technologies to capture the interests of all the students in the class which results in more inquiry and innovation in learning.

Cultural processes and Teacher-educators'-trainers' technology knowledge and skills

When we talk of culture, in general these are beliefs and values of a group, and this concept of culture has been pointed out in number of ways to potentially promote teacher educators' and trainees' digital competence. So, a number of cultural processes or values were looked at in this study and these included but not limited to: beliefs, feelings, disciplinary

background, curriculum, ICT structures, policies and leadership styles. Chai, Koh and Tsai (2010) in Shan (2013) investigated pre-service teachers' beliefs about the use of computer technology and the effectiveness of ICT courses. Their results indicate that; after participating in ICT courses, pre-service teachers recognized the importance of technology integration into their curricula and believed that ICT use would enhance student learning. These teachers felt that such ICT integration courses prepared them to apply ICT in the future and that their abilities to select, evaluate, and use a variety of technological resources improved. The other studies which also revealed that teacher's belief were so significant in influencing ICT integration levels include: Zhang (2013); Dudeney (2010); Capan (2012) and Cassim & Obono (2011) and they all believed that the way teachers position themselves in line with ICT use in teaching, definitely influences their user ability levels.

In line with the above, it has been observed that; teachers who have believed that ICT has a positive influence on teaching for example in supporting say; content design and development, delivery, assessment and learner feedback, do try hard to apply ICT so as to cultivate meaningful learning. And also, Donnelly, McGarr & O'Reilly (2011) indicates that, ICT integration outcomes in the learning and teaching contexts are reliant to a significant degree on what teachers do and think. Despite the fact that, all these previous studies do agree on the role of institution culture in promoting ICT integration in teaching and learning, the attention has been so limited at Makerere University, much as some reasonable effort has been made to work on some aspects like provision of computers and internet. So, what has been lacking in this sense is majorly lack of understanding of the role of social constructivist approach, teacher trainers and trainees need to understand that teaching as a job has been transformed and the new modifications now emphasize the learner, not the teacher as the master of knowledge building, learner generation of knowledge is more valued and promoted, so learning is now looked at as; seeing the learner in action in terms of knowledge creation. In this way, there is need of creating an atmosphere which can support action learning, and like research has already revealed it that, ICT integration is the answer. Sharing experiences

and expertise in ICT integration will make use of the available resources and promote learner-centered approach through social interactions. For example, a teacher interested in creating online content may seek support from another lecturer who has experience in this, but again today some learners are knowledge, for example, they know how to create online groups by using, email accounts, whats app groups have also become order of the day to facilitate mobile learning methods. All this effort will help both the teacher educator and trainees in acquiring a number of technology skills and knowledge such as; content analysis, media literacy, information management and communication.

In the same line, Ward and Parr (2010) also found out that, teachers who believe in themselves have gained a lot of confidence and ability to facilitate student learning with technology and in a number of cases they have received improved learner attainment. Attaining this goal in teacher training means encouraging teacher trainers and trainees to always associate their curriculum design and development activities to ICT use in teaching, and so implementing effective teaching with technology requires changes in teachers' attitude and beliefs. However, TPACK framework has been appraised for being the basis for effective teaching using ICT, it is criticized on the basis that, it fails to take into consideration the teachers beliefs and attitude about teaching which are considered very important factors when teaching with ICT (Graham, 2011).

Other factors that were rated critical in promoting teacher educators' and trainees' technology skills and knowledge included: teaching experience and level of education. According to Yusuf (2005) in Boakye (2013), experience was found to be a very important factor that influences the use of technologies by lecturers in teaching. He reports that, lecturers' willingness to apply technologies in teaching increases with increasing teaching experience. Similarly, teaching experience is said to increase with effectiveness of teaching using technology (Win, 2002) in Boakye (2013). Again Win (2002) found out that, lecturers' level of education influences their ability to teach using technologies.

Academic discipline was looked at as the teacher's area of specialization and it is presumed that; an individual's subject discipline greatly influences teacher's ability to uptake or abandon technology integration (technology knowledge and skills). Subject disciplines are divided up into knowledge areas. Usually these disciplines have their own values and the particular trainers in these specific disciplines attach these values and beliefs in terms of relevance and approaches to deliver them. An academic discipline is a branch of learning or scholarly instruction (Oxford English Dictionary). Biglan (1973) categorized academic disciplines as; **hard-applied** which focus on problem solving and application of knowledge to create products and techniques such as: engineering, computer science, Food science, agriculture etc; **soft-applied** disciplines focus on personal growth, reflective practice and lifelong learning to create protocols and procedures which may include: Law, Education, accounting etc. Then, **hard-pure** disciplines are concerned with mastery of physical environment such as: Physics, Chemistry, Biology, Mathematics, Zoology etc and also **soft-pure** disciplines which are concerned with enhancement of professional practice and these include: languages, history, psychology, political science, philosophy etc.

Table 2: Biglan's classification of academic disciplines

	Hard	**Soft**
Pure	Biology, Biochemistry, Genetics, Physiology, Mathematics, Physics, Chemistry, Geology, Astronomy, Oceanography etc.	Psychology, Sociology, Anthropology, Political Science, Linguistics, Literature, Creative Writing, Economics, Philosophy, Archaeology, History, Geography, etc.
Applied	Agriculture, Psychiatry, Medicine, Pharmacy, Dentistry, Horticulture, Civil Engineering, Telecommunication Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering, Computer Science, etc.	Education, Nursing, Counseling, HR Management, Finance, Accounting, Banking, Marketing, Journalism, Library And Archival Science, Law, Architecture, Interior Design, Crafts, Dance, Music, etc.

Czerniewicz & Brown (2007), explored disciplinary differences in the use of Information and Communication Technologies (ICTs) for teaching and learning in five higher education institutions in the South Africa and they found out that there are significant differences in the way the different disciplines are taught and it is assumed therefore that, the ways in which information and communication technologies (ICTs) are used as part of teaching and learning in specific disciplines are also different. If it is true that discipline categories are potential domains of applying information technology in teaching and learning, there is need to understand the level of application depending on the discipline requirement and needs within School of Education and hence help other teacher trainers also to understand the critical areas within their curriculum that may require digital skills and knowledge. This approach will not only help in future curriculum design and development, but also helps University managers to understand which specific ICT infrastructure may be relevant for a particular discipline.

Institutional facilities such as computers and computer accessories, internet, technical services and so on, were considered to play a major role in promoting teacher educators' and trainees' technology knowledge and skills (Tezci, 2011). During the technology integration process into teaching, the teacher trainers and trainees need school support to enable them develop the technological knowledge; that is, an understanding of how to use technology tools, as well as their pedagogical knowledge. The school support can be in form of ensuring that, there are adequate ICT facilities such as computers and other computer accessories since these are the core needs for ICT integration. When ICT facilities are in place it becomes easier and even may easily become a common practice for teachers to interact with their students using the technology such as; learning platforms, Google classrooms, group mailing lists etc. In such an environment, teacher trainers as well as the trainees talk to their colleagues about ICT and discover new relationships with staff members who perceive the same benefits from technology use such as time-saving and improved material preparation. Not only should the teacher trainers learn how to

integrate technology in teaching, but also should learn from a student-centered perspective how ICT can be major tool into the different classroom activities, in that sense, promoting student-centered learning. Teacher trainers need to use ICT in more creative and productive ways in order to create more engaging and rewarding activities and more effective lessons, so that the teacher trainees of student teachers take the same trend for their future delivery. When institutional leaders have a positive attitude towards ICT, they will always work towards improving on the facilities and vice versa. Actually, Pelgrum and Law (2009) in Shan (2013) emphasize that effective ICT integration depends on the perceptions and vision of school leaders rather than teachers' ICT skills and knowledge. School or institutional culture has a mediating role that promotes teachers' actions. In order to explore teacher perceptions of school culture related to the level of ICT usage, also Tezci (2011b) in Shan (2013) examined Turkish teacher perceptions. The results showed that their perceptions were not positive, because the majority did not believe that they would receive adequate facilities, technical and motivational support from their school leaders, however, as the school culture became more positive, the teachers' ICT usage level increased.

Leadership styles and technology skills and knowledge: leadership styles have been found to be so positive in influencing teachers' technology knowledge and skills, good institutional leaders will lay clear platforms for better teaching and amongst these is technology integration. However, there are different leadership styles and each type influences institutional progress differently. Leadership styles commonly practiced by university administrators include; authoritative, distributed, transactional and transformational and these were believed to promote teacher trainers and trainees' digital skills and knowledge:

Authoritative leadership and technology skills and knowledge: This leadership style is characterized with absolute authority, directives, commands, and rebuke from the top leader. Shamaki (2015) did not support authoritarian kind of leadership style saying that, employees

under this leadership style work under pressure and fear which negatively affects their performance and limiting their creative ability thus limiting levels of adoption of any form of innovation. Wu and Shiu (2009) have echoed similar sentiments when they noted that authoritarian leadership style is gained through punishment, threat, demands, orders, rules, and regulations, this kind of approach cannot promote teacher educators' technology knowledge and skills since technology adoption is supposed to be at free will, not by force. However, Nampa (2007) in Aunga and Masare (2017) has cautioned that leaders who want the best results should not rely on a single leadership style; however these did not support a specific leadership style for promoting new innovations. On the other hand, authoritarian leaders are goal seekers as Bush (2011) contend, they emphasize goal achievement by keeping staff focused on tasks to be accomplished, in this sense, such leaders have to ensure that members achieve goals, implement plans and programmes and meet standards. So, despite the fact that such individuals lead others under a lot pressure, they are goal achievers, so if there plans to promote ICT integration, most likely they will achieve it, although with a lot fear in the people they lead.

Distributed leadership and technology skills and knowledge: This form of leadership style focuses on an open environment, where institution or college decisions involve not only the chief administrators like Vice Chancellor and College Principals, but should also include other members of staff such as; members of College management committee, vice principals, Deans and Heads of Department (Leith wood et al., 2009). Clark (2007) also indicates that, distributed leadership is characterized by consultation, empowerment, joint decision making, and power sharing. Teacher trainers' participation in the making of decisions creates a sense of ownership amongst them and it makes them feel valued which then promotes staff morale. Sloan (2013) also found distributed leadership has an important element in developing an inquiry versus compliance orientation to implementation. Since technology skills and knowledge are not automatically

acquired, this style of leadership that promotes inquiry helps teacher trainers to seek help from colleagues in the different Units who may have succeeded in ICT integration.

Bruce, Noel and Dibbon (2014) indicated that whereas some researchers reported an inverse relationship between the application of distributed leadership on teachers' technology knowledge and skills, their analysis indicated that distributed leadership is important in building the leadership capacity of teacher trainers through their participation in the leadership of their respective Schools and Departments which also enhances their enthusiasm and morale for their roles in School or Department. In the same way, the assumption that decisions are reached by consensus may cause conflicts and disagreements among academic staff due to differences in ideologies leading to disunity and causes individual ineffectiveness. Whereas Bush (2011) argues that, professionals have their own views and there is no guarantee of unanimity on outcomes. Failure to agree on certain matters may cause dissensions and rivalry which may affect individual performance and inability to adopt new innovations such as ICT integration. Technology knowledge and skills are aimed at improving teaching and learning process, so any teacher trainer and trainee is expected to embrace it, since this is the modern way of teaching. Social constructivism as an approach has gained a lot of momentum today, just because gaining skills and knowledge has become a shared responsibility, social interactions are not bound to which policy, but rather personal belief and attitude.

Transactional leadership and teacher performance: Transactional leadership is a process of exchange of transactions between the leaders and the followers (North house, 2007). The exchange is often in a form of material or tangible rewards like bonuses, salaries and other incentives (Hukpati, 2009). Identifying the needs of the followers is considered one of the best traits of a transactional leader to improve their performance. This could be a two-way approach where the College or School administrators can take time to identify what the academic staff want before introducing to them any new ideas such as technology innovations. Although on the

other hand, the teacher trainers themselves can also make an initiative to find out what their learners need.

However, Transactional leadership is generally sufficient for maintaining the status quo (Bass, 1985). This might be one of the weaknesses of this leadership style, because training institutions are dynamic, in other words, things like the curriculum keep on changing (curriculum review is done every after five, according to the National Council for Higher Education, in Uganda) which would then require a leadership style that is flexible and fit for adjustment. Under this style, leaders focus on giving rewards to motivate employees, such as; teacher trainers' adoption of technology knowledge and skills may be attached to a reward to encourage its adoption. For example, the any academic staff that develops a computer-based course is awarded or paid for extra load; this can definitely empower all academic staff to gain these technology knowledge and skills which in the end will increase their performance towards effective teaching. The reverse also holds true that those teacher trainers who fail to adopt new technology and skills are denied of some allowances, definitely this will serve as a motivator to all academic staff to change their teaching approaches from teacher-centered approach to learner-centered one which is technology-based. Although Kashagate (2013) found that a university leadership which employs transactional leadership is less likely to inspire its employees in adoption of new skills and knowledge, and such results require farther investigations.

Transformational leadership and technology skills and knowledge: Transformational leadership style concentrates on three pillars; to convey inspiration and vision to employees, individual attention and then offering an intellectual challenge. This style of leadership emphasizes that employees' motivation is not only derived from external factors such as salary and good working conditions, but also intrinsic motivation aspects like appreciation and practicing responsibility. In this way, transformational leaders are able to focus on standards, values, needs and capacities. This implies that, this leadership style focuses primarily on the

process where administrators seek to influence achievement of educational goals. Actually, Cardwell and Spinks (1992) argue that transformational leaders succeed in gaining the commitment of followers to such a degree that higher levels of accomplishment become virtually a moral imperative. To achieve success, such an administrator creates a good relationship, working hand in hand with colleagues to identify what needs to be changed in the institution/School, inspires workers by always reminding them of the vision and encourages them to achieve the goal. This involvement through inspiration increases employee performance because their willingness to engage in productive teaching and self-efficacy will be strengthened. Odumeru & Ogbonna (2013) found Transformational leadership behaviors to have been positively correlated with teachers' positive perceptions, motivation, trust, conviction, collaboration, innovation, self-esteem and performance which reflect a willingness to learn and adopt new working mechanisms such as integration of ICTs in teaching and learning.

A recent study carried out in Tanzania by Aunga, and Masare (2017) focused on effect of leadership styles on teachers' performance in primary schools in Arusha District. Results revealed a direct and positive connection between transformational leadership style and teachers' performance. Consequently, one of the major recommendations was that if teachers' performance is to be increased, then school leadership should be a transformational style. The research by Kashagate (2013) also showed a positive correlation between transformational leadership dimensions and teachers' performance. In an Institution where a leader such as the Principal, Dean, Head of Department is a good listener and supportive to fellow workers, there is a likely positive outcome. In a related development, the analysis of Bateh and Heyliger (2014); Singh (2015); Kovjanic et al (2013) all indicated that faculty members who identified transformational leadership as dominant had increased performance. Individual teacher trainer's performance is in line with the ability to identify new ways of teaching; such new approaches include the adoption and application of digital technologies in teaching. Although, researchers like; Gutierrez (2013)

did not find any relevance of employees' perceptions of leadership behaviors as being an important predictor of their performance. This is quite an important observation to note because, perceptions of institutional leadership behaviors in some studies were found positively correlated with several other factors like; employee turn-over, retention, job satisfaction, effectiveness etc. (Johnson, Akraft, Papay, 2012). Therefore this causes a question of whether teacher educators under a certain leadership style may end up adopting ICT in teaching.

Curriculum design and technology knowledge and skills

The relevancy of ICT knowledge and skills in curriculum has been realized for a long time to promote effective teaching and learning in the modern world. Researchers like Bisaso (2006) also revealed that, the interest in developing educational technology solutions to curriculum and instruction problems has been ever increasing. Bisaso farther indicates that, Governments at all levels had expressed support for educational technology initiatives, for example the Uganda Ministry of Education SchoolNet project, and the CurriculumNet project at the National Curriculum Development Centre (NCDC), and the latter was tasked to develop content online or computer-based curriculum instructional materials (National Curriculum Development Centre, 2004). However, in Uganda where accountability is not taken seriously especially in the public sector, because if the Country had taken up such initiatives, teaching and learning would have continued even during periods of emergencies like the Corona Virus pandemic where all schools and higher learning institutions in Uganda were all closed on 20th March 2020 indefinitely which caused a lot of confusion and concern to all stakeholders, and panic started when Government thought of conducting teaching and learning online, minus a prepared ground for it. Developing a study curriculum for any level; the goal, particular objectives and expected learning outcomes are stated to basically give a clear direction and focus of the concerned parties/ beneficiaries. Given the climate of technological innovation and the rise of the creative class, the job market has changed drastically over the past 20 years, resulting from a number of technology innovations

across the globe giving way to a multitude of careers and new operation approaches. In Uganda today, the major stakeholders in our education systems are the; parents, children, teachers, employers and the general public. All stakeholders and the policy makers are very much aware of the global changes in the way education is delivered and how the 21st century students must learn. This highlights the fact that, if we are to attain our education objectives, then we must aim at producing a teacher of a modern world who is digital competent, the curriculum must address this noble cause, and so developed in such a way that, it meets the formal standards of technology integration. Features of technology knowledge and skills must be highlighted at the design and development stage of the intended curriculum.

Many teacher trainers today have failed to acquire specific ICT skills and knowledge simply because these were not embedded within the curriculum. In this context, it is important that teacher trainers in the various institutions need to consider the ultimate goal of their profession and the methods they can employ to be successful in preparing students for an uncertain and undetermined world. Teachers around the world today are taking a skills-based approach to education to prepare students to build careers and be active citizens after completing school (Sahlberg, 2010). Thus, it is important to minimize any gap between technology knowledge and skills required by teachers in the future. In undertaking this process, teachers need to know that students are unique, requiring a differentiated learning approach for their progress in relation to the curriculum, as well as their knowledge and skills relevant to the 21st century.

Faculties, departments or colleges have considerable autonomy over curriculum issues and the process of teaching and learning (Bergquist & Pawlak, 2008). This means, the way a curriculum is designed and developed; it must clearly indicate the pedagogical aspects of ICT integration in that each teacher trainer is mandated to have an ICT component in the course taught. This kind of arrangement is still lacking in teacher training institutions in Uganda, and hence teacher trainees graduate without digital skills and knowledge; this limits their potential to

adopt such skills after graduation. Tosun & Barişusing (2011:223) believed that universities which want to reposition themselves in the market, they must have a strategic plan which clearly indicates how technology integration should be done, and this arrangement must be in line with the teaching curriculum. The teacher trainers must do a lot of practical training to demonstrate their digital skills and knowledge in the classroom to ensure that the investment is not a waste of resources, by this teacher trainers will embrace teaching strategies that are more learner-centered and focus on the needs of learners. Preparing teachers today to meet future challenges is a major mission of higher education in Uganda because there is a big call to transform our education system most especially the teaching approaches, so that the children are brought up as knowledge creators not merely consumers.

Ling (2014), indicates that, Educational reforms today are faced with a number of challenges that have long been existing in the higher educational system: the hierarchical nature of institutional structures, which has constrained the dynamics of pedagogical innovations; large blended classrooms, which have suffered from a lack of interactivity; the teacher-dominated pedagogy which reinforces the negative effects of passive non-participatory learning; and the examination-oriented knowledge transformation model, which fails to cultivate students' critical thinking and problem solving skills (Shi, 2010). If teachers are to make their instruction more career relevant and practical for their students, they need to know which essential skills will be transferable across different fields of work in the 21st century. It is evident that certain digital competence skills and knowledge will be necessary for students to develop to be able to work and contribute in a globalized information society. Let it be clear that most of these 21st century skills, like critical thinking and problem solving, are not new. The relevance of these skills is that changes to the global economy and career trends have brought them to the forefront as requirements of employability and individual success (Rotherham & Willingham, 2010).

However, it is uncertain what sort of knowledge and skills will still be relevant by the time they graduate and start their careers. The purpose of ICT in the educational curriculum is to enhance the learning process through the interaction of students, teachers and course content as speculated by Obunadike (2009). That is why, Aguti (2016) also emphasized that, much as a lot has been done to promote teacher educators' and trainees' digital skills and knowledge, there is still need for continuous transformation of the curriculum to include ICTs for teaching and learning. She further reported that, "changes in the curricula without corresponding transformation in assessment often encourages neglect of those areas that are not examined". Transformation of curricula must therefore be accompanied by transformation of the assessment strategies, and the computer technology facilitates best this mode of assessment where learners are requested to test their ability in a certain field of study at a self-paced mode, but timed by the server. Computers aided instruction helps students to become knowledge developers, reduces the amount of direct instruction given to them by teachers, and gives teachers an opportunity to help those students with other more complicated tasks. Therefore, curriculum development, if properly accredited, is one of the most effectual protections against poor educational and development outcomes; however, it may not be cure-all, since there are other factors. However, ICT can enhance the application of the curriculum to achieve success in education and development.

Policy guidelines

Universities need to ensure that the implementation of ICT integration strategies is followed by the monitoring, evaluation and feedback processes for the purpose of quality assurance. Unfortunately, Makerere University ICT policy (2016 – 2020, page 6) emphasizes that, the policy promotes the use of ICT to support teaching and learning, unfortunately it does not clearly indicate how the entire innovation is implemented. The same policy on page nine points to the College Principals/ Heads of Department to be in charge of technology integration in the teaching, and a lot of attention has been put on to infrastructure and accessibility, however it

does not provide the framework for this cause. When you look at the National ICT policy for Uganda, page forty, it suggests a review of the curricula at primary, secondary and tertiary levels in order to pedagogically integrate ICTs in the teaching and learning process, impart teachers with the necessary ICT skills and knowledge in order to enable them use ICTs in the teaching and learning process. This seem to have remained on paper, but actual integration has been lacking because also the National budget does not guide how much financial support should specifically go to the integration process of these ICTs in teaching.

National ICT policies can serve several important functions as indicated in some studies (Jones, 2003; Kozma, 2003a). It is further indicated that, strategic policies can provide a rationale, a set of goals, and a vision for how education systems might be with the introduction of ICT, and how students, teachers, parents, and the general population might benefit from its use in schools especially transforming education at large and the teaching approaches. These strategic policies can motivate, change, and coordinate disparate efforts, so as to advance a nation's overall educational goals. It is again believed that, much as certain innovations can happen minus a policy, implementation requires some guidelines and rules of procedure. So, minus the guidance of national policies and the resources of corollary programs, it is less likely that individual innovations will be sustained in teaching.

Borrowing a leaf from the recommendations of UNESCO (2015) for successful implementation of future ICT integration policies, they indicated that: the national ICT policy must be driven by a vision that can be operationalized into realistic and manageable goals; a holistic approach must be taken towards the national ICT policy in education; and some four dimensions were identified; curriculum and assessment, learning resources, teacher development, and physical and technological infrastructure; there should be a division in the MOE that is responsible for coordinating and implementing the ICT Master plan in education; a good physical and technological infrastructure is a necessary condition for effective ICT integration; teachers must

have ready and frequent access to ICT both during and after curriculum hours, so as to access information and learning resources; prepare lesson plans; deliver their lessons; assign work and respond to their students' scripts and projects; communicate with their peers and supervisors; and perform administrative tasks; ICT should be placed in all teaching, learning, and even play areas in the school. This encourages the use of ICT both within and outside curriculum time, making ICT an integral part of all activities in school; Mobile computing offers schools opportunities that include overcoming constraints of space and giving flexibility in anytime-anywhere utilization of ICT in schools; the advantages of networking of schools go beyond access to the Internet. They also include sharing of resources and collaboration within the school, among schools, and with other organizations.

Aguti (2016) emphasizes the need to have appropriate policies and policy environments that support transformation, creativity and innovation. An innovation such technology integration in teaching requires policies and guidelines which pave the implementation process. Accordingly, UNESCO (2012) also at the international level, policy for integrating ICT for development was first formulated in the Millennium Development Goals (MDGs) Target 8.F, which states that “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications” (United Nations, 2012). It is highly arguable that ICT plays a pivotal role in achieving these goals, including broadening access, eliminating exclusion, and improving quality. Researchers like; Foley & Ojeda (2008) in Waycott, Bennett, Gregor, Dalgarno, & Gray (2010) indicated that, the limited use of educational technologies in university teaching is due to limitations in national and institutional policies and management practices about ICT integration.

UNESCO (2012) repeats that, despite the growing demand for data on ICT in education, the best-known international sources of education statistics lack basic information about ICT policy in education. This could be one of the many reasons especially in the developing countries why

technology integration and digital competence skills and knowledge are still limited amongst the teacher trainers, so introduction of ICT integration policy is necessary for change, much as this may not guarantee implementation or impact. In line with the above, Cohen and Hill (2001), found out that, policies can, fail to succeed especially when: they are viewed as mere symbolic gestures; teachers trainers actively resist policy-based change that they see as imposed from the outside without their input or participation; they do not have clear connections to instructional practice for example studying hardware rather than their relationship to pedagogy; they do not provide teachers with an opportunity to learn the policies and their instructional implications; and also there is a lack of programme and resource alignment to the policies' intentions. While it is true that some policies may fail, identifying those particular policies that have been applied in other countries that have current active policies that address ICT in education or other types of formal commitments including plans, regulatory provisions or a regulatory institution is important in helping teacher trainers at Makerere University.

Makerere University has got an ICT policy but, it lacks proper guidelines on the integration of ICT in teaching and most especially the supervisory aspect of the Deans and Heads of Department. Makerere University council during its special council sitting on the 13/07/2016 adopted and approved the new Makerere ICT Policy and Strategic Plan 2016-2021 which became effective on the 14th/07/2016. Council members believed that most ICT milestones in the 2008-2018 Makerere ICT Strategic Plan have not been attained due to limited funding and in order to avoid a recurrence of a similar situation, the University Council agreed to having the technology fee ring-fenced for three years starting with the financial year 2016/17 in order to enable DICTS implement activities of the Makerere ICT strategic plan 2016-2021. However, it must be noted that technology integration skills and knowledge are not as a result of funding, but rather guidelines and perhaps frameworks for acquisition. Otherwise, if ICT integration was majorly about funding, Makerere University has been receiving funds from different bodies like NORAD for quite a

number of years, but most of the teacher trainers have not been able to use ICTs in teaching. In the same line, Uganda as a Country, there are general ICT policies, however they do not clearly address teacher training aspects of ICT, there are no clear guidelines on how teacher trainers are going to acquire and use the digital skills and knowledge. In many universities all over the world Makerere inclusive, policies on ICT and education have been including training and professional development strategies on the pedagogical use of ICT, but digital skills and knowledge amongst teacher trainers especially in developing countries have remained so low (OECD, 2015).

According to UNESCO (2015), ICT Competency Framework for Teachers (2011), which has been used as reference for the development of national standards in different countries, is arranged in three successive stages of progress in the use of ICT: acquisition of basic ICT knowledge, knowledge deepening, and knowledge creation. At each of these stages, the competencies are specified according to the areas integrated in educational policies, curriculum and assessment, pedagogy, ICT, organization and administration, and professional development. So institutions of higher learning especially the teacher training institutions like Makerere University need to identify the particular curriculum areas which require technology integration and set up clear policies and guidelines to govern the use of ICTs in developing and delivering the identified piece of the curriculum.

Accordingly, UNESCO (2015), further indicates that, digital competence policy document are aimed at: promoting the harmonization of activities, approaches and standards in the educational uses of Information and Communications Technology (ICT) within the Education System; encouraging the principals, Deans, teacher trainers and students within the education system to use ICT, meaningfully, to enhance the teaching-learning process; ensuring that there exists equitable access to ICT resources by all students and teachers within the Education system; ensuring that all teacher trainees are provided with the required ICT skills for employment or entry to specialized training in the Information Technology field; fostering the concept of Life Long

Learning among students and teachers; providing greater professional development opportunities for all ICT educators; creating a cadre of ICT educators with the requisite skills and competencies to use and promote ICT as a tool in the enhancement of the teaching / learning process; make provisions for the continuous upgrade of the ICT skills and knowledge of teacher educators; providing the avenue for increased electronic networking and collaboration of educators and students.

Ottestad (2013) indicates that, there is need to have in place some educational policy documents to dictate teachers to use specific ICT tools in teaching and learning, since teacher's selection criteria of ICT tools is influenced by curriculum reforms that aim to move from pen and paper styles of learning to digital didactical design and media tablet (iPads) programs, it is quite imperative to have guidelines. Subject policy and curriculum also emerged to measure and determine the type of ICT to use in teaching and learning. The result of Malakia & Cloneria (2018) aligns with that of McGarr (2009) which indicates that, the proliferation of ICT in society aid the transition from teaching ICT as a discrete informatics subjects into viewing ICT as a technological approach for learning across the curriculum. This therefore calls for some set of guidelines that can be used as a basis for integrating ICT in the curriculum so that it caters for the learners' diverse learning needs, accessibility and availability of the ICT devices.

Along the same line, Care, Vista, Kim, & Anderson (2019) also believe that one of the most important aspects of ICT integration that needs to be addressed include policy as this greatly influences the delivery of teaching and learning- curriculum, assessment and classroom practices. There should be policies on how the curriculum should be developed to include ICT component, learner assessment, for example; teacher educators may be encouraged to apply online assignments, projects and also classroom practices to include some use of computer-based materials. Again Kim et al. (2019b), in line with teaching for the 21st Century Skills in Africa, highlight the need to bridge any system level gaps between policy, intent, curriculum and real classroom practice in

relation to 21st Century Skills development. Most specifically, this means ensuring alignment between curriculum, pedagogy, teacher training and learning assessments. For example, when the components in the system are misaligned, changes in curriculum reform may yield few improvements in student learning if the other parts of the system, such as assessment and pedagogy, are not similarly adjusted.

Conclusion

In Ugandan context, there have been no any attempts yet to cultivate teacher educators digital competence using basing on this approach, more particularly in School of Education, Makerere University. Some current studies related ICT in teaching and learning at Makerere University like; Kabugo, Masagazi & Mugagga (2015), their study was informed by Kolb's Experiential Learning Theory (ELT) and they investigated Teacher-Trainees' Abstract Conceptualizations of Emerging Technologies in Teaching to Revitalize Luganda Language. It is true that, through Experiential learning theory, researchers aimed at technology cultivation in teacher education; however, their idea was based on experiential learning whereas in this study emphasis was on social and cultural processes, experimenting teacher educators' and trainees' digital competence from a social interactive point of view amongst teacher-student and content.

Kimoga (2014) also looked at lecturers' perceptions on using information and communications technology in higher education institutions, and his findings were more on the lecturers' mode of using ICT, for example, his findings indicated that, only female lecturers confirmed using ICT for surfing and PowerPoint. This study was not about enriching teacher educators' technology knowledge and skills, but rather the extent to which lecturers have been able to utilize the available ICTs. Therefore, this study was set out to explore the possible opportunities Makerere University can adopt to promote teacher educators' digital competence through a social constructivist approach.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter looks at study methodology, so as to solve the research problem. It is the science of learning the way research should be performed systematically. It refers to the rigorous analysis of the methods applied in the stream of research, to ensure that the conclusions drawn are valid, reliable and credible. The chapter therefore includes: Philosophy or Epistemology, paradigm, methodology, design, population, sampling, data collection methods and data analysis, but the key sub themes of the chapter are hereby summarized in Tale 3.1 as follows: philosophy, paradigm, methodology, method, design, data collection and analysis.

Table 3.1: Summary of Adopted Research Methodology

Level of Decision	**Choice**	**Author (s)**
Epistemology	Social Constructivism	Crotty (1998)
Research Paradigm	Interpretivist	Creswell (2007)
Research Methodology	Qualitative	Crotty (1998)
Research Design	Interpretive Action Research Design	Creswell (2015)
Data Collections methods	Interview, FGD, Observation	Crotty (1998); Creswell (2012)
Data analysis	Transcription	Miles & Huberman (1994)

Epistemology: By epistemology, we are talking about the philosophical underpinning which guided the study and**, in this sense,**, the researcher adopted *social constructivism lens* which postulates that we get to know what know by constructing it, implying that meaning does not exist somewhere waiting to be discovered, we have to construct it by engaging with reality in the world. Crotty (1998) defines epistemology or philosophy as, "how we know what we know" (1998, p. 3).

Crotty (1998) argues that we construct meaning about the research world through three basic processes: objectivism, constructionism, and subjectivism. According to Abdul and Khalid (2016), epistemology refers to "the branch of philosophy that studies the nature of knowledge and the process by which knowledge is acquired and validated" (Gall, Gall, & Borg, 2003, p. 13). It is concerned with "the nature and forms of knowledge, how it can be acquired and how communicated to other human beings" (Cohen, Manion, & Morrison, 2007, p. 7). It is the epistemological question that leads a researcher to debate "the possibility and desirability of objectivity, subjectivity, causality, validity, generalisability" (Patton, 2002, p. 134). Adhering to an ontological belief system (explicitly or implicitly) guides one to certain epistemological assumptions.

Therefore, if a singular verifiable truth is assumed, "then the posture of the knower must be one of objective detachment or value freedom in order to be able to discover 'how things really are' and 'how things really work'" (Guba & Lincoln, 1994, p. 108). Conversely, belief in socially constructed multiple realities leads researchers to reject the notion that people should be studied like objects of natural sciences; they get involved with the subjects and try and understand phenomena in their contexts.

Research Paradigm: The study adopted an *interpretivist* philosophical stance, and according to Taylor, Kermode, and Roberts (2007, p. 5), a paradigm is "a broad view or perspective of something". The interpretive paradigm is associated more with methodological approaches that provide an opportunity for the voice, concerns and practices of research participants to be heard. According to Pulla and Elizabeth (2018), it is said that the foundations of interpretivist probably began with the works of Max Webber (1864-1920) and Alfred Schutz (1899-1959) who attempted to establish an objective science of the subjective. Their intention was to produce a form of verifiable knowledge of the meanings that make up and illustrate the true social world. This paradigm emphasizes the ability of a researcher to interpret what a particular

group of people has observed and interpreted as a result of social actions, so it is basically interpreting the other people interpretation of a natural phenomenon. Interpretivism is a "response to the over-dominance of positivism" (Grix, 2004, p. 82) in Abdul and Khalid (2016). Interpretivism rejects the notion that a single, verifiable reality exists independent of our senses. Instead, interpretivists believe that knowledge is as a result of socially constructed multiple realities. As exactly emphasized in social constructivism, individuals interact with other individuals and society and ascribe meaning and names to different social phenomena.

The key words pertaining to this methodology are participation, collaboration and engagement (Henning, van Rensburg, and Smit, 2004). In the interpretive approach the researcher does not stand above or outside, but is a participant observer (Carr and Kemmis, 1986, p. 88) who engages in the activities and discerns the meanings of actions as they are expressed within specific social contexts. According to Grix (2004), in Abdul, R., and Khalid, A. (2016), "researchers are inextricably part of the social reality being researched, i.e. they are not 'detached' from the subject they are studying" (p.83). The goal of interpretive research is not to discover universal, context and value free knowledge and truth but to try to understand the interpretations of individuals about the social phenomena they interact with. If one believes in multiple socially constructed realities, it follows that these realities are approached from different angles by different people. These further argue that, social researchers can only collect data from some point of view, by making 'observations' through spectacles with lenses that are shaped and colored by the researcher's language, culture, discipline-based knowledge, past experiences (professional and lay), and experiences that follow. Interpretivists will always collect mostly qualitative data from participants over an extended period of time, as in ethnography and case studies. The approach to analyzing data thus generated is inductive, i.e. the researcher tries to discover patterns in the data which are collapsed under broad themes to understand a phenomenon and generate theory. Data from the interpretive perspective are mostly verbal instead of statistical. Interpretive researchers employ

methods that generate qualitative data, and although numerical data could be involved at some point, they are not relied upon so much. Examples of data collection methods that yield qualitative data include open ended interviews with varying degrees of structure (standardized open-ended interviews, semi-standardized open ended interviews, and informal conversational interview), observations, filed notes, personal notes, documents etc. The major characteristics of interpretive paradigm have been summarized in the Table below.

Table 3.2: Summary of major characteristics of the interpretivist paradigm

Feature	**Description**
Purpose of research	Understand and interpret students' and teachers' perspectives on the factors that could impact the successful use of e-learning and face-to-face instructional approaches in a manner that they complement each other.
Ontology	• There are multiple realities.

	• Reality can be explored, and constructed through human interactions, and meaningful actions. • Discover how people make sense of their social worlds in the natural setting by means of daily routines, conversations and writings while interacting with others around them. These writings could be text and visual pictures. • Many social realities exist due to varying human experience, including people's knowledge, views, interpretations and experiences.
Epistemology	• Events are understood through the mental processes of interpretation that is influenced by interaction with social contexts. • Those active in the research process socially construct knowledge by experiencing the real life or natural settings. • Inquirer and the inquired-into are interlocked in an interactive process of talking and listening, reading and writing. • More personal, interactive mode of data collection.
Methodology	• Processes of data collected by text messages, interviews, and reflective sessions; • Research is a product of the values of the researcher.

The interpretivist paradigm has been criticized for, among other things, being "soft", incapable of yielding theories that could be generalized to larger populations and the involvement of the researcher with participants which leads to lack of objectivity (Grix, 2004). However, Richards (2003) disagrees and states that qualitative inquiry is not "soft… it demands rigour, precision, systematicity, and careful attention to detail" (p.6). Although positivist research has its merits, there are a number of social phenomena that could be best investigated under the interpretive paradigm. For example, studying the extent to which the application of social interactions resulting from the social constructivist theory can promote teacher educators' and trainees' technology knowledge and skills. Interpretive paradigm is a very critical area which

requires rigour to establish realities through individual and group participation, ability to manage group discussions and then interpreting their interpretations is worthy an investigation which cannot be managed with a positivist perspective where, surveys, closed ended questionnaires and lists of numbers alone are not the best option in this, since these are not designed to explore the complexities and the immensely complicated social world that we inhabit.

Research Methodology: The study adopted a *qualitative approach*, and being a qualitative study, it seeks to understand the individual and their personal interpretations of the subject's experience. The qualitative methodology shares its philosophical foundation with the interpretive paradigm which supports the view that there are many truths and multiple realities. A methodology is "the strategy, plan of action, process or design lying behind the choice and use of particular methods" (Crotty, 1998 p. 3). Ellen (1984) looks at methodology as "an articulated, theoretically informed approach to the production of data". It guides the researcher in deciding what type of data is required for a study and which data collection tools will be most appropriate for the purpose of his/her study. It is the methodological question that leads the researcher to ask how the world should be studied. The research involves viewing the individual in a holistic manner taking into account the context of the person's experience. Interpretive paradigm sits comfortably in qualitative research approach particularly with methods such as ethnography and grounded theory, alongside narrative analysis, constructivism, phenomenological approaches that are relatively new to the scene. In agreement with Henn *et al* (2005), the researcher applied qualitative research because the concepts under study here i.e. social, cultural processes, technology knowledge and skill more often involve a lot of descriptions, that is; assessing the extent to which these social processes which involve social interactions can promote the acquisition of technology knowledge and skills. For that matter, the study was underpinned by the interpretive school of thought or subjective/qualitative paradigm at times referred to as; humanistic or naturalistic (Creswell, 2007), which places significant importance to the subjectivity. This research paradigm

contends that, reality is socially constructed (Mertens, 2005, p.12) and so, the paradigm studies people in their natural settings and multiple interpretations (Oates, 2006:293); Walsham (2006) also agrees that, the interpretive research aims to understand social settings and realities. In addition, interpretivism calls for engagement with the research phenomenon and the use of multiple interpretations and perspectives which offer other possible analyses of how to improve teacher educators' and trainees' digital competences.

According to Creswell (2003), a qualitative approach is the one under which the researcher makes knowledge claims based primarily on constructivist perspectives, knowledge resulting from multiple meanings of individual experiences and meanings which are socially and historically constructed with an aim of either developing a theory or pattern or advocacy participatory perspectives or even both. This study is *advocating for the application of social constructivism* as a measure of helping teacher trainers and trainees in acquiring technology knowledge and skills in a more simplified and cheaper way, which the researcher referred to as; utilizing a social constructivist approach to cultivate or promote teacher educators'-trainees' digital competence, in other words it was aimed at bring about change for the better in terms of ICT integration. Miles and Huberman (1984), on the other hand, believed that qualitative research involves how the researcher gives meaning to a social phenomenon/event through contrasting, comparing, replicating, cataloguing and classifying the object of study. This study examined the extent to which social and cultural processes promote digital competence of teacher educators and teacher trainees, so it was well pinned by the qualitative research because this approach according to Myers & Avison (2002) enables researchers to study social and cultural phenomena and to understand people and their social and cultural contexts.

Although the usefulness of qualitative research has been questioned as there are concerns about the generalisability of the research results to other groups (Voyer & Trondman, 2015), according to Pulla and Elizabeth (2018), qualitative research is meant to study a specific issue or

phenomenon in relation to a certain population, location or context. It is therefore considered that generalisability of qualitative research is not possible, but trends in qualitative research through meta-analysis have been able to increase the possibility of generalisability (Lawrence, 2015). Meta-analysis is the systematic analysis of several qualitative research projects that are examining the same phenomenon.

Research Design: interpretive action research design

Overview

First of all, the study aimed at establishing how social constructivist approach can be used to develop teacher educators' and trainees' technology knowledge and skills and therefore this required a practical approach of arriving at results and finding solution. Hence, an interpretive action design was applied and this helped the researcher to interpret the interpretations of the participants about the phenomenon. Interpretive action research design is a methodological framework which is usually undertaken to solve an immediate problem or considered as a reflective process of progressive problem solving led by individuals working with others in teams to improve the way they address issues and solve problems.

According to; Bogdan & Bilken (1992); Lewin (1958); Stringer (2008) in Gregory (2013), interpretive action design is a process of systematic inquiry that seeks to improve social issues affecting the lives of everyday people. Action design can be traced way back to the work of Kurt Lewin, who viewed this research methodology as cyclical, dynamic, and collaborative in nature. He believed that, through repeated cycles of planning, observing, and reflecting, individuals and groups engaged in action research can implement changes required for social improvement. According to Ferrance, (2000), interpretive action design is a process in which participants examine their own educational practice systematically and carefully, using the techniques of research. According to Creswell (2012), action designs can utilize both quantitative and qualitative data, however, in this particular study, only qualitative data were collected although major

emphasis here is about the procedures used in addressing practical problems in schools and the classrooms environment. Interpretive action research designs are systematic procedures used by teachers (or other individuals in an educational setting) to gather data to address improvements in their educational setting, their teaching, and the learning of their students. In some action research designs, the researcher seeks to address and solve local, practical problems, such as a classroom-discipline issue for a teacher. In other studies, the objective might be to empower, transform, and emancipate individuals in educational settings.

Interpretive action research design involves actively participating individuals in a change situation, usually through the school or organization. The design properly suits the study which has practical elements of intervention, where teacher trainer and trainees are engaged in social constructivist environment, where teacher and students are active in a learning process to generate new knowledge and skills. This fits within the selected school of thought, "social constructivism" where we expect learners to work in a team in a collaborative process. Interpretive action research design provides teacher-educators with the opportunity to improve on their teaching approaches and also become more aware of the options and possibilities for change from traditional to modern teaching approaches, so as to develop lifelong learners who seek to improve their knowledge and practice. Action Research assists practitioners and other stake holders in identifying the needs, assessing the development process, and evaluating the outcomes of the instructional changes they define, design, and implement. The researcher adopted a practical action research which studies a local practice and focuses on teacher development and students' learning practices, then apply a collaborative model where he worked with one teacher trainer and student teacher to expand technology knowledge and skills in teaching.

Characteristics of interpretive action research design

There are several characteristics for interpretive action research design but I chose to emphasize the following:

Future Orientation: In dealing with the practical concerns of people, in interpretive action research design is oriented towards creating a more desirable future for them;

Collaborative in Nature: Interdependence between the participants and the researcher is an essential feature of interpretive action research design;

Context-specific: Interpretive action research design is implemented in a "classroom" but not necessary inside a building by a particular teacher or group of teachers who work together to pursue a change or improvement in their teaching and learning issues; so it leads to change and the improvement of practice not just knowledge in itself.

Justification for choosing an interpretive action research design

The main study objective was to utilize social constructivism approach to cultivate teacher-educators' digital competence in teaching at Makerere University. The theory looks at learning as a process of interaction where teachers and learners work collaboratively to build knowledge as a team. This called for a particular approach that aimed at nurturing the practice of teaching and learning with technology. Today's learners prefer to be taught in a special way which is suitable within the technologically driven environment, learners are therefore more comfortable to do most of their activities with certain supporting technologies such as; computers and mobile smart phones. So, the teacher educators need to be actively supported in developing the necessary technology; knowledge and skills. There are quite a number of reasons for adopting an interpretive action research methodology:

1. It allows teacher-educators to investigate their own practice in new ways, looking deeper in what they and their students actually do and fail to do in terms of technology integration. This gives teacher educators something more concrete to work with instead of just relying on the principles which they have used in the past.

2. Interpretive action research design facilitates deeper understanding of students and the teaching process; this promotes a better learning environment. By actually reflecting on what a teacher is doing in the classroom, it becomes easier to see what problems are there and there is usually some indication of how to go about solving the problems.
3. The teaching profession requires professional development, so action research being an on-going process promotes teacher-educators 'competences.
4. Positions teacher educators as learners who seek to narrow the gap between practice and their vision education.

Interpretive Action Research Design Framework

The research applied Kurt Lewin's model of interpretive action research design process and it summarizes the entire process in three stages:

Figure 3.1: Kurt Lewin's model of action research process

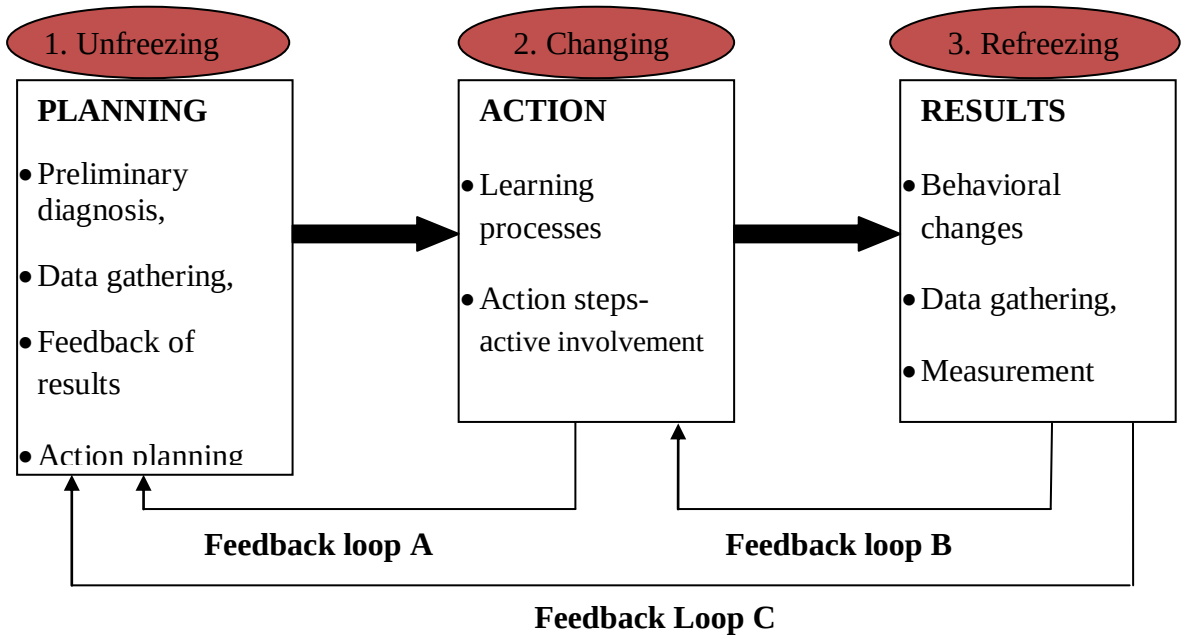


Figure 3.1 summarizes the steps and processes involved in trying to create changes in any organization for example; changing from teacher-centered to learner centered teaching approach. It is a cycle which can be repeated overtime depending on the need and level of change required:

Stage One: Planning Phase (*carried out: **21st February to 7th March 2019***)**.** First of all**,** Lewin refers to this stage as; unfreezing, meaning the individuals are faced with a problem and become aware of it and need to work on it or change. This means that, at first the teacher trainer and the trainees did not know how they could use the google classroom platform to facilitate the learning process, but after exposure and experimentation they were able to gain some insight (consciousness). The major elements of this stage included; a preliminary diagnosis, data gathering, feedback of results, and joint action planning. In the study background, the researcher explained the problem of traditional teaching approaches within the teacher educators at Makerere University and indeed he felt there was need to transform teaching and learning process. Basing on social constructivist approach, the researcher intended to develop a new teaching approach of using available ICT resources to facilitate teaching and learning. Social constructivist encourages collaborations and active involvement from both sides of the teacher trainers and the learners. In this regard at this stage, the researcher worked with one teacher trainer with low levels of ICT integration (low level user) got her on-board to learn how to work with ICTs in teaching from the advanced user (s) of ICTs. Again at this very planning stage, the researcher got on board eight undergraduate student teachers offering Economics and these were briefed about the study aim. Since the intention of the study was to develop teacher educators' digital competence via social constructivism. At this stage, the researcher demonstrated the potential of ICT tools in promoting teacher-student interactions and showed participants how best to make use of simple devices like mobile phones to upload and also access the study content. This orientation process lasted for two weeks whereby the researcher and the teacher trainer plus the teacher trainees had to make all the necessary arrangements for the project. It was at this stage where the lead researcher identified a learning platform (*https://classroom.Google.com*) for the research project which all the participants (low level user, teacher trainees and the researcher) used for demonstration purposes of social

constructivism framework visa-vi digital competence to promote teaching and learning as reflected in theoretical framework (*figure 1.1*).

What is Google classroom?

First of all, Google classroom is a hub where you can communicate with your learners, provide them with constructive feedback whenever they needed it, and streamline the sharing of classroom documents and assignments. Google Classroom is available through Google Apps for Education and its aim is to facilitate blended learning. Google classroom was selected because of the various advantages such as; easy accessibility, this platform can be accessed from all computers, mobile phones, and tablets as long as they have Chrome browser. It makes it really very easy for teachers to add as many learners as they would wish, create Google documents to manage assignments and announcements; it allows the posting of YouTube videos, adding of links, or file attachment from Google Drive. Very easy for the learners to log in, as well as receive and submit assignments.

Promotes effective communication and information sharing, as we aware that social constructivism puts a lot of emphasis on interactions which definitely involve exchange of information amongst learners and their teachers, so Google classroom allows the sharing of Google Docs. These documents are saved online and shared amongst learners, for example, when you create an announcement or assignment using a Google doc, your learners can access it immediately through their Google Drive, as long as you have shared it with them. Furthermore, Google Docs are easily organized and personalized in Google Drive folders. In other words, you no longer need emails to share information; you just create a document, share it with a group of learners without limitation in numbers.

Further, Google classroom is a user-friendly interface. Google Classroom invites you to an environment where every single design detail is simple, intuitive, and user-friendly. Needless to say, Google users will feel right at home. Effective feedback; one of the critical elements of

teaching is providing effective feedback. Google Classroom gives you the opportunity to offer your online support to your learners right away; this means that feedback becomes more effective, as fresh comments and remarks have bigger impact on learners' minds.

Google classroom integrates goggle drive and docs in an environment for classroom teaching. It can be used to create classes, distribute and collect assignments and communicate with students. Teachers can quickly see who has or has not completed the work, and provide direct, real-time feedback and grades right in the classroom. Classroom is particularly well suited for working with documents and integrating web-based content (You Tube Videos, Arts and Culture, etc.). We will also demonstrate several Classroom extensions and add-ons which provide additional functionality.

Creating a Google classroom

Like already mentioned amongst the advantages of Google classroom that, it is easy to use and access, its creation process is also so simple and has a few steps:

1. Start by creating a Gmail user account and ensure that all your users have Gmail accounts.
2. Open a Web browser and go to *https://classroom.Google.com.* You have to sign in with your

   Google Apps for Education account.
3. On the Welcome screen, click the plus sign at the top and choose Create Class.
4. In the Create a Class dialogue box, type in the Class Name and Section.
5. Click Create.

Your new classroom is created and it has got three main tabs:

1. **Stream:** This is where you manage your class assignments and make announcements to the class. You can add new assignments, with due dates and attached materials. Upcoming assignments are shown at the left. Also, just with social media services, you can send a message to your entire class — even with an attachment.

2. **Students:** This is where you manage learners from. You can invite students to your classroom from here and manage their permissions level. To invite students to your class, you have to set them up as Google Contacts in your Google Apps for Education account or they have to be in the school's directory.
3. **About:** This is where you can add the course title and description, add a location for the class, and add materials to your class's Google Drive folder.

So, the researcher created a class group on Google classroom under the name of ***(****My Economics class*). After creating a Google classroom portal for our teaching and learning interactions, the lead researcher together with his subject expert (low level user) identified a topic of study from Economics (*demand and supply*). Participants were enrolled into the course ready for stage two. So, the researcher as well as the teacher educator made the necessary preparations especially the materials to use, designed some assessment tasks. Thereafter, a brief discussion was held about the orientation period to get the participants' views of the project.

Stage Two: the action, or **transformation or changing phase (***carried out: **14th March up to 4th April 2019)*.** This is a stage at which the situation is diagnosed and new models of behavior are explored, actual learning started at this stage at lasted for four weeks. It included actions relating to teaching and learning processes (perhaps in the form of role analysis) and to planning and executing behavioral changes in the learners. Included in this stage is action-planning activity carried out jointly by the researcher and the participants. At this stage, the knowledgeable technology user, in this case the researcher managed the instruction process on the identified topic as indicated in the planning stage. The teacher trainer (low level user) who was part of the participants together with student trainees were fully engaged and actively attended all sessions and did the online exercises. The aim at this stage was to allow the low level technology user learn from the more competent user how to manage learner in a social constructivist approach, learners

were involved in a number social interactive activities, teacher-learner collaborations as well as learner-learner and content collaborations were indeed high. Following the previous planning preparations (in stage one), these action steps are carried out by the more competent in an interactive way, trying to show a transform approach, helping learning generate their own understanding through interactions, thus traditional approach versus modern teaching approach, from teacher centered to learner centered system. As shown in *Figure 3.1*, feedback at this stage would move via Feedback Loop A and would have the effect of altering previous planning to bring the teaching and learning activities better in a new learner-centered approach. After which, this stage was tested through collecting data from the participants (both the learner and their teacher trainer). The stage lasted for four weeks, till the researcher was indeed confident that, participants (both the teacher trainer and the students) were now conversant of the new teaching approaches.

Stage Three: Results phase or the refreezing stage (*carried out: **11th April to 2nd May 2019***). This stage includes actual changes in behavior (if any) resulting from corrective action steps taken following the second stage. The teacher trainer enrolled a group into the Google classroom to exercise the acquired knowledge and skills (*same group but now under the low level user*). This stage was entirely based on the data that were gathered from the participants (both the students and the lecturers). Progress at this stage was determined and necessary adjustments in teaching and learning activities were made. Any minor adjustments at this level were made in learning activities via Feedback Loop B and Feedback Loop C *(see Figure3. 1)*. The low level user took on full control over the teaching process, a learner-centered approach was employed and social interactions were further promoted by the teacher trainer who comfortably managed to facilitate learning by using the acquired technology knowledge and skills from stage two (*from a more competent user*). The question here was; do we see any new changes in the learning/teaching process after implementing the adopted social constructivism approach? The researcher was able to collect data using focus group discussion guide, all participants met and interacted about the

activities though out the project, the adopted skill and knowledge were highlighted as indicated in the results section (chapter four).

Participants

Participants were majorly: academic staff and teacher trainees. School of Education has got a total of 64 academic staff according to the statistical data of 2017 and student population of 2616. The main student target population was only 565 and these were the third year students offering Bachelor of Arts with Education (BAED), and the researcher was mainly interested in students who offered Economics as a teaching subject, since the researcher was also to be a participant in the study, so he preferred an area where he is also knowledgeable. Why third year students, because these have had reasonable amount of time in the University and did school practice in their second year, so aspects addressed by the study were not new story to them. Again, the researcher targeted only teacher trainers and trainees on full time training program, not evening or distance learners because the aspect of access to ICT equipment could have been perhaps a problem to some. Specifically, the targeted population covered teacher trainers and teacher trainees from the School of Education, both female and male academic staff within the departments of: Humanities and Language Education; Science, Technical and Vocational Education; Foundation and Curriculum Studies. For the teacher trainees, the researcher only concentrated on one Department (Humanities and Language Education) because the researcher specifically wanted to work with only third year students who offer Economics.

Table 3.3: Total distribution of academic staff within School of Education

CEES academic staff establishment as of March 2017	Target	Accessible	Sampled
School of Education	**population**	**population**	
Humanities and Language Education			
Professor	3		
Senior lecturer	3		
Lecturer	11		
Assistant lecturer	13		
Sub Total	**30**	**20**	**15**
Science, Technical and Vocational Education			
Associate professor	1		
Senior lecturer	2		
Lecturer	2		
Assistant lecturer	5		
Sub Total	**10**	**5**	**5**
Foundation and Curriculum Studies			
Associate professor	2		
Senior lecturer	4		
Lecturer	8		
Assistant lecturer	10		
Sub Total	**24**	**12**	**6**
Grand Total	**64**	**37**	**26**

Source: College of Education and External Studies, HR's Department (2017)

Table 3.4: Total distribution of students within School of Education

BAED -- Bachelor of Arts with Education

Year of study	Male	Female	Total
Year I	211	320	531
Year II	251	448	699
Year III	212	353	565
Sub Total	**674**	**1121**	**1795**
BSED -- Bachelor of Science with Education			
Year I	216	70	286
Year II	216	53	269
Year III	210	56	266
Sub Total	**642**	**179**	**821**
Grand Total	**1316**	**1300**	**2616**

Source: College of Education and External Studies, AR's Office (2017)

Sample size

Birchall (2009) suggested that, in most studies access to the entire population is near to impossible and the selected sample usually reflects extremely related information as that which would have been obtained from the entire population. Being a qualitative study the issue was not all about a large sample size but rather a reasonable sample, actually; Miles, Huberman, & Saldana (2014); indicate that, with qualitative studies there is no standard sample size, but what determines the size is the level of saturation, so data for objectives one and two (interpretive action design) were generally collected from ten participants, and these included; the researcher, one teacher trainer and 8 teacher trainees. However, on top of the ten people, the researcher needed to get some in-depth information from other academic staff from the school, and so each Department was represented as follows: Humanities and Language Education, Science (15), Technical and Vocational Education (5), Foundation and Curriculum Studies (6) were interviewed, total number of academic staff was 26, but there was one special teacher trainer who the researcher described as a low level user, this one was fully involved in the social interactions with teacher trainees, plus 8 students, making a total of *35 participant*. Creswell, (1998) indicates that, in qualitative research

any number between 5 and 25 is adequate and since the sample size was even above the proposed standard, we can ably say that, the sample size was adequate.

Sampling

Stratified sampling technique was used to select participants from the different departments because each department in this case served as stratum, then the researcher purposively selected participants from the three Departments that make up School of Education, that is; Department of Humanities and Language Education, Department of Science, Technical and Vocational Education and Department of Foundation and Curriculum Studies. Then, the researcher ***purposively*** selected one lecturer (teacher trainer) whom in the study was referred to as the low level user of ICTs in teaching. Since the study adopted social constructivism and the researcher was much interested in seeing how low level ICT user learns from competent user, so the researcher had to purposively select a person whose level in ICT integration and subject area are well known by the researcher. The purposive sampling, according to Kasonde (2013), involves using common sense and best judgment to choose a certain group in the population, likely to provide rich information needed for the study. The researcher worked with third year students offering Economics, but since these were very few, about 12 in the class the researcher offered a chance to all of them to participate freely, but since participation was optional and upon consent, so the researcher used ***convenient*** sampling techniques to select eight participants, and since the researcher only had interest in students offering Economic, simply because the researcher was also knowledgeable in that field. This was aimed at analyzing students' competences from within their specific disciplines (Sekaran, 2003).

Data collection methods

The last element of research that Crotty (1998) suggests is methods. Methods are "the techniques or procedures used to gather and analyze data" (Crotty, 1998, p.3). Both secondary and primary methods of collecting data were applied: at secondary level, the researcher used a

documentary review method in order identify gaps in existing literature which the study intended to cover up. This method looked at seminal literature which guided the researcher in developing the study background and the literature review section, so secondary sources like: textbooks, journal articles, annual reports and dissertations were used. Whereas at primary level, the researcher collected qualitative data using the following methods:

Focus group discussion method

Focus group discussion is a method which involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It is a form of qualitative method of data collection where questions are asked about people's perceptions and attitudes, beliefs, opinion or ideas. Focus group discussion is less structured compared to interviews, simply because of the difficulty in bringing structure in a group; however, rich data can emerge through interaction within the group, for example, sensitive issues that could have been missed in individual interviews, may be revealed here. In a group, people develop and express ideas they would not have thought about on their own. Maughan (2003) recommends the membership of an ideal focus group to range from six to twelve subjects. This method was applied to collect data for the; first and second object, and therefore the teacher trainer and trainees who were part of the study intervention used this method.

Interview method

An interview method is a qualitative research method which involves the conducting of intensive individual asking of questions to a small number of respondents in order to explore their perspectives on a particular idea or program. Interviews are methods of gathering information through oral quiz using a set of preplanned core questions, and interviews can be very productive since the interviewer can pursue specific issues of concern that may lead to focused and constructive suggestions. Saunders, Lewis & Thornhill (2007) indicate that the use of interviews helps one to gather valid and reliable data which are relevant to the research question(s) and

objectives. The researcher adopted interviews for the following advantages in data collection as indicated by Shneiderman and Plaisant (2005) that:

a) They provide direct contact with the users often leads to specific, constructive suggestions;

b) They are good at obtaining detailed information, since they give room for probing for more details and also allow the interviewee to explain their points in detail;

c) They require few participants to gather rich and detailed data.

Depending on the need and design, interviews can be unstructured, structured, and semi-structured with individuals, or may be focus-group interviews, but for more elaborate information, the researcher adopted a semi-structured interview which combines both features of unstructured and structured. As a result, it has the advantage of both methods of interview. In order to be consistent with all participants, the interviewer has a set of pre-planned core questions for guidance such that the same areas are covered with each interviewee. This method was used to gather data from other academic staff who were not part of the intervention (objective three).

Observation method

An observation is a way to gather data by watching people, events, or noting physical characteristics in their natural setting. Observations can be overt (subjects know they are being observed) or covert (do not know they are being watched). Participant observation according to Calhoun (2002) is a method of research in which involves extended engagement in a culture and participation in its day-to-day activities. It is further revealed that, this type of research methodology is used in circumstances where an individual wants to observe a group to which they do not belong without altering the behavior of the group. Because of this, before observations can be noted as being "natural," the observer must immerse themselves in the culture or group they are observing. Cresswell (2012) revealed two types of observation; participant observation and non-

participant observation. A participant observer is an observer who takes part in activities in the setting he/she observes whereas, a nonparticipant observer is an observer who visits a site and records notes without becoming involved in the activities of the participants.

This study adopted a participant observer method because the participants physically interacted with participants and ensured them of freedom of expression to enable them contribute immensely. Observation methods were found to have a number of advantages; flexible approach to data collection in that, it suitable for a broad range of contexts; observation can produce a mix of qualitative and quantitative data. For example, when observing people in a group situation, you might count up how many times certain interactions occur (quantitative), while also taking freehand notes about the nature of the group dynamics (qualitative); structured observation helps provide measures or records of behaviours. So, since the researcher had things like participants' skills to observe, this was a good approach and it indeed generated a lot of data for the study.

Data collection instruments

Data collection instruments are the tools used by researchers to actually collect data in the research process and below is what the researcher adopted:

Focus Group Discussion Guide

A focus group is conducted in the presence of a moderator to ensure that the results are as unbiased and legitimate as possible. Focus groups are conducted with participants who have a common interest in the topic of discussion. The purpose of a focus group is not about arriving at a common consensus or some level of agreement or to decide what to do about the topic being discussed, but rather these are designed to identify and understand perceptions, feelings and know what people might think about a particular product/practice or service or phenomenon. Since the study was looking at social interactions and when actually a focus group discussion uses qualitative

data collection methods just as the dynamics in real life participants are able to interact freely and the desired outcome is mostly unbiased, so the researcher felt it was more suitable and appropriate to adopt FGD for this kind of study. For this matter, a discussion guide (*appendix A*) and this had basically two major sections; *Section A: Social processes and teacher-trainers'/ trainees' technology knowledge* whereas *Section B: Social processes and teacher-trainers'/ trainees' technology skills.* Test items for each section were generated to allow respondents give their views and feelings with some sort of guidance.

Individual Interview Guide

To collect data from teacher educator, a structured interview guide was used (*Appendix B*). This was composed of a list of questions for the participants' guidance and intervention by the researcher during the interview process. This instrument collected data about; social processes and teacher educator's technology knowledge and skills. Each objective had specific semi-structured questions which guided the interview process. As the interview progresses, the interviewee is given opportunity to elaborate or provide more relevant information if he/she opts to do so, as a result both closed and open questions were used:

Unstructured Interviews

Unstructured interviews allow the interviewer to pose some open-ended questions and the interviewee to express his/her own opinion freely. This requires both the interviewer and the interviewee to be at ease because it is like a discussion or brainstorming on the given topic. The direction of the interview is determined by both the interviewee and interviewer, not predetermined. According to Preece, Rogers, and Sharp (2002) it makes it difficult to standardize the interview across different interviewees, since each interview takes on its own format. However, it is possible to generate rich data, information and ideas in such conversations because the level of questioning can be varied to suit the context and that the interviewer can quiz the interviewee more deeply on specific issues as they arise; although it can be very time consuming and difficult to

analyze the data. The researcher had to ask questions which were not in the interview guide but with an aim of digging for deeper information and in some cases it would require some kind of clarification before the respondent would give and answer. The researcher found this to be a very effective approach for data collection in events were participants are not so conversant with the subject of interest, so since technology integration is still an areas with a lot of gaps at the University, the approach was very useful in getting more classified data.

Structured interviews

In structured interviews, the interviewer uses a set of predetermined questions which are short and clearly worded; in most cases, these questions are closed and therefore, require precise answers in the form of a set of options read out or presented on paper. This type of interviewing is easy to conduct and can be easily standardized as the same questions are asked to all participants. According to Preece, Rogers, and Sharp (2002), structured interviews are most appropriate when the goals of the study are clearly understood, and specific questions can be identified. So, in this case, the researcher interacted with teacher educators about how they felt on how the cultural processes of the social constructivist approach support the development of technology knowledge and skills.

Descriptive Observational Checklist

Observation as a data collection instrument involves making use of the senses of sight, touch, smell, sound and sometimes even taste to interpret social reality (Bryman, 2012). An observation guide was very necessary in assessing social processes in objectives one and two. Interpretive action research design requires the use of multiple sources of data collection instruments as one engages with the social world, in this way the data from observation were useful to support data from focus group discussions and questionnaire since these observations helped us to understand exactly how the teacher trainers and trainees improve their ICT integration skills from a more knowledgeable user. The following technology skills were monitored; Data and

Information management, communication, content creation and problem solving. The researcher had a checklist (*appendix C*) to indicate whether a participant possessed such indicators of technology knowledge and skills, respectively.

Data collection procedure

The researcher obtained an introductory letter from the Dean, School of Education, College of Education and External Studies allowing him to carry out data collection. Since this study had two levels of data collection, that is, data from academic staff, then data from students which involved action research arrangements. Being an interpretive action design, data collection procedure was a bit detailed; The researcher first approached different academic staff, trying to request for their time and be involved in the study, many indeed accepted, and we agreed on to when to conduct the interview sessions. At the same time, the researcher planned for the action research phase which started in *February 2019*. The researcher identified a teacher trainer and ten students offering Economics and necessary arrangements were done to get on board, real engagement activities were scheduled, and it was done at three stages; planning stage, action stage and then also refreezing stage. Data were collected at all these three stages and thereafter, entry, edit and analyses were performed on the data.

Data analysis

The researcher applied qualitative data analysis method adopting Miles & Huberman's (1994) model of "transcendental realism" which involves three stages of analysis: *data reduction*, *display*, and *conclusion*. At the data reduction stage, the researcher summarized data transcripts from the Focus Group Discussion, interviews, field notes, and observations while discarding irrelevant data; at the display stage, the researcher presented the data in form of tables, paragraphs, highlighting some key statements and at the conclusion stage, the researcher verified data, made interpretations, and drew conclusions.

Trustworthiness of the Study

The traditional criteria for ensuring the credibility of research data: objectivity, reliability and validity are used in scientific and experimental studies because they are often based on standardized instruments and can be assessed in a relatively straightforward manner. In contrast, qualitative studies are usually not based upon standardized instruments and they often utilize smaller, non-random samples. Therefore, these evaluation criteria cannot be strictly applied to the qualitative paradigm, particularly when the researcher is more interested in questioning and understanding the meaning and interpretation of phenomena. Merriam (1998) cautions researchers that a debate is raging because the constructs of reliability and validity are quantitative and positivist, and not necessarily that are applicable to qualitative research (p. 199). However, there are several possible strategies and criteria that can be used to enhance the trustworthiness of qualitative research findings. Trustworthiness is the corresponding term used in qualitative research as a measure of the quality of research. It is the extent to which the data and data analysis are believable and trustworthy. Creswell (1998) suggests that "the trustworthiness of qualitative research can be established by using four strategies: credibility, transferability, dependability and conformability:

Credibility

Credibility in qualitative research is defined as the extent to which the data and data analysis are believable and trustworthy. Credibility is analogous to *internal validity*, that is, how research findings match reality. However, according to the philosophy underlying qualitative research, reality is relative to meaning that people construct within social contexts. Qualitative research is valid to the researcher and not necessarily to others due to the possibility of multiple realities. It is upon the reader to judge the extent of its credibility based on his/her on understanding of the study. Most rationalists would propose that there is not a single reality to be discovered, but that each individual constructs a personal reality (Smith and Ragan, 2005). Thus, from an interpretive perspective, understanding is co-created and there is no objective truth or reality to

which the results of a study can be compared. Therefore, the researcher involved some of the study participants in cross-checking for the gaps after data interpretation, and so comments were made were necessary and feedback on the data, interpretations, and conclusions from the participants themselves, was received and pun into consideration, hence it was one method of increasing credibility of this research.

Transferability

Research findings are transferable or generalizable only if they fit into new contexts outside the actual study context. Transferability is analogous to *external validity*, that is, the extent to which findings can be generalized. Generalizability refers to the extent to which one can extend the account of a particular situation or population to other persons, times or setting than those directly studied (Maxwell, 2002). This is a very tricky aspect when it comes to qualitative research and it is not the mandate of the researcher to make this undertaking, according to Pulla and Elizabeth (2018), qualitative research is meant to study a specific issue or phenomenon in relation to a certain population, location, or context. It is therefore considered that generalizability of qualitative research is not possible, but trends in qualitative research through meta-analysis have been able to increase the possibility of generalizability (Lawrence, 2015). Meta-analysis is the systematic analysis of several qualitative research projects that are examining the same phenomenon. So, these study findings will be open for anyone doing a similar study in the same line, and hence meta-analysis may lead to generalizability at some given point in time. Actually, this study has already been published in different articles which creates room for sharing it with people in the same field.

On the other hand, Seale (1999) advocates that transferability is achieved by providing a detailed, rich description of the settings studied to provide the reader with sufficient information to be able to judge the applicability of the findings to other settings that they know. Therefore, it is a requirement that the researcher documents and justifies the methodological approach, and

describes, in detail, the critical processes and procedures that have helped him to construct, shape and connect meanings associated with those phenomena which the researcher has labored to do very systematically in this study, the study provides first of all; clear research questions and an easy to understand methodology, so this provides enough information for transferability of the study findings.

Dependability

Dependability is analogous to *reliability*, that is, the consistency of observing the same finding under similar circumstances. According to Merriam (1998), it refers to the extent to which research findings can be replicated (p. 205) with similar subjects in a similar context. It emphasizes the importance of the researcher accounting for or describing the changing contexts and circumstances that are fundamental to consistency of the research outcome. Reliability is problematic and is practically impossible as human behaviour is not static, is highly contextual and changes continuously depending on various influencing factors. It is further compounded by the possibility of multiple interpretations of reality by the study subjects; a similar study with different subjects or in a different institution with different organizational culture and context or by a different researcher may not necessarily yield the same results. The quality of inferences also depends on the personal construction of meanings based on individual experience of the researcher and how skilled the researcher is at gathering the data and interpreting them. For that case, Merriam (1998) provides the following six strategies to enhance reliability in qualitative research:

- Triangulation – using multiple sources of data or techniques to confirm emerging findings; this study adopted; interview, focus group discussions and observations.
- Member checks – taking data and tentative interpretations back to the people from whom they were derived and asking them if the results are plausible; the researcher complied to this recommendation.

- Long-term observation; the observation took about one Month; a period the researcher thinks is adequate.
- Peer examination; two colleagues in the same field of education technology peer reviewed the instruments and necessary adjustments were made before actual data collection exercise.
- Participatory modes of research; the study itself was participative where the researcher and respondents were fully involved in the social interactions which were the basis of the study.
- Clarifying the researcher's biases, assumptions, worldview and theoretical orientation at the outset of the study: Social constructivism was the theoretical underpinning of this study, and right from the beginning it was a basis of the rest of the study arguments.

So, in this study I used various data collection instruments, but also, I used participants' evaluation method where the study findings were reviewed by the very participants to ensure that what was reported was in line with what they exactly indicated or observed.

Conformability

Conformability is the degree to which the research findings can be confirmed or corroborated by others. It is analogous to ***objectivity***, that is, the extent to which a researcher is aware of or accounts for individual subjectivity or bias. Seale (1999) argues that auditing could also be used to establish conformability in which the researcher makes the provision of a methodological self-critical account of how the research was done. To make auditing possible by other researchers, it is a good idea that the researcher archives all collected data in a well-organized, retrievable form so that it can be made available to them if the findings are challenged. In this sense, on top of giving a very clear and detailed study methodology, the researcher intends to keep all the collected data for future reference and use just in case there is any query. In addition to this, expert evaluation was also a critical aspect of conformability, and for that matter, two lecturers who coincidentally, are colleagues to the Researcher were selected to engage in some

observational activities, they were briefed on the goal of the study and given copies of all evaluation tools used in the study early enough. These visited our focus group discussion sessions and one of them helped in also auditing the online learning space for an evaluation of the pedagogical benefits of blended learning.

Ethical considerations

Ethical sound research considers the interest of the public, the respondents and research profession. This being a qualitative study, the researcher must interact deeply with the participants and the tutor, thus entering their personal domains of values, weaknesses, individual learning disabilities and the like to collect data. Creswell (2003) states that the researcher has an obligation to respect the rights, needs, values and desires of the informants. Miles and Huberman (1994) list several issues that researchers must be aware of regarding participants:

- Informed consent (Do participants have full knowledge of what is involved?)
- Honesty and trust (Is the researcher being truthful in presenting data?)
- Privacy, confidentiality, and anonymity (Will the study intrude too much into group behaviours?)
- Voluntary participation (Do participants agree freely to be part of the study?)

Therefore, appropriate steps were taken to adhere to strict ethical guidelines to uphold participants' privacy, confidentiality, dignity, rights, and anonymity. In view of the forging discussions, the following section describes how ethical issues in the conduct of the research have been addressed in this study:

i) *Informed consent:* The Researcher informed the participants – the students and their tutor - of the purpose, nature, data collection methods, and extent of the research prior to commencement. Further, the Researcher explained to them their typical roles; this was very critical

as the approach was all together different form the traditional face-to-face approaches. In line with this, the Researcher obtained their informed consent in writing in the format given in (*Appendix D*).

ii) *Honesty and trust:* Adhering strictly to all the ethical guidelines serves as standards about the honesty and trustworthiness of the data collected and the accompanying data analysis. I obtained an introductory letter from the Dean, School of Education before collecting data from any respondent.

iii) *Privacy, confidentiality, and anonymity:* The Researcher ensured that the confidentiality and anonymity of the participants would be maintained through the removal of any identifying characteristics before widespread dissemination of information. The Researcher made sure that the participants' names would not be used for any other purposes, nor will information be shared that reveals their identity in any way.

vi) *Voluntary participation:* It was made clear to the participants that the research was only for academic purpose and their participation in it was voluntary as indicated in the consent letter. No one was forced to participate in the study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

Introduction

This Chapter deals with the analysis of the data collected from the field, after which the data were presented in themes and then interpreted. The study adopted a qualitative data collection approach and therefore data from the interview guide, focus group discussion and observations were analyzed using transcendental realism: *data reduction*, *display*, and *conclusion*, but started with respondents' background as presented in frequency distribution tables:

Respondents' Background

This Section gives a description of the background of respondents both the teacher educators and trainees. For the action research process and that is for study objectives one and two; there was one female teacher trainer and eight teacher trainees (undergraduate level) participated from the Economics discipline; three teacher trainees were females, and five teacher trainees were males; however the researcher did not have any interest in the age and other background factors of this category of respondents, and so such background elements were not included in the instrument. These teacher trainees were in their third year of study, the researcher preferred to work with participants who have attempted teaching and since these had gained some teaching experience during their first school practice which is usually carried out after their second year. On the other hand, data collected for the third objective were basically from only a group of teacher trainers selected from the three departments represented as follows: Humanities and Language Education 14 (almost 53%), Foundation and Curriculum Studies 7 (27 %) and Science, Technical and Vocational Education 5 (19 %). From the above data, it is clearly indicated that, the biggest number of participants came from The Department of Humanities and Language Education and this could be attributed to the fact that, this Department has got the biggest number of lecturers (30) followed

by Foundation and Curriculum Studies (24), these facts are based on College of Education and External Studies, AR's Office (2017).

Table 4.1: Distribution of academic staff according to Subject specialty

Subject	Frequency	Percent	Cumulative Percent
Mathematics	2	8	8
Physics	1	4	12
Chemistry	2	8	19
Luganda Language	3	12	31
English Language	2	8	39
Geography	1	4	42
Educational Technology	2	8	50
Curriculum Studies	5	19	69
Economics	2	8	77
Language pedagogy	1	4	81
History	1	4	85
Religious studies	2	8	92
Music	1	4	96
Art and Design	1	4	100
Total	26	100	

Source: Primary data, 2019

In line with subject specialty, curriculum area had 19% of the total participants followed by Luganda Language almost 12%, but this was because, some academic fields have got very few lecturers, subjects like; music, history, Language pedagogy and Art and Design have got fewer lecturers by the system structure which determined their level of participation in the study. These different academic subjects require application of digital skills and knowledge, but disciplinary category and needs dictate the level of technology use.

Table 4.2: Distribution of academic staff according to level of education

Level	Frequency	Percent	Cumulative Percent
Masters	13	50	50
PhD	12	46	96
Post Doctorate	1	4	100
Total	26	100	

Source: Primary data, 2019

Study findings indicate that, half (46% and 4% = 50%) of the teacher educators have already attained their PhDs, one person had even already acquired a Post Doctorate and very many academic staff are on PhD program in different universities, promising to complete in the next two to three years from now. This implies that, perhaps five years from now, majority of the teacher educators at Makerere University will possess PhDs. It is assumed that the more qualified the individual teacher educator, the more the person applies the best teaching approaches, which implies that the level of technology integration will increase as more academic staff attain higher academic levels of excellence (PhD).

Table 4.3: Distribution of academic staff according to teaching experience

Years in teaching	Frequency	Percent	Cumulative Percent
Less than 5 years	3	12	12
Between 5 and 10 years	12	46	58
Between 10 and 15 years	8	31	89
More than 20 years	3	12	100
Total	26	100	

Source: Primary data, 2019

Findings indicate that majority of the respondents (46%) have been teaching for a period of five to ten years, and about 12% had taught for less than five years. This indicates that, the biggest number of teacher educators have a lot of experience and therefore would have all it takes to have appropriate digital skills and knowledge to deliver teaching and learning in this digital age keeping other factors constant. Basing on the study results, most of the teacher

trainers who have been in service for more than five years seem to possess reasonable technology skills and knowledge; however, its application has been limited by a number of other factors such as; facilities and time.

Table 4.4: Distribution of academic staff according to Rank in the University system

Category	Frequency	Percent	Cumulative Percent
Assistant Lecturer	11	42	42
Lecturer	14	54	96
Associate Professor	1	4	100
Total	26	100	

Source: Primary data, 2019

It should be noted clearly that Table 4.4 does not present a list of all the ranks of teacher trainers in the School of Education, but only those who participated in the study. Study results indicate that, a big number of academic staff were already at the rank of lecturer (54%), and then some at the level of assistant lecturers (42%), only one respondent was at the level of an Associate Professor. This background variable does not have anything to depict about teacher educators' digital competence, but the researcher was only interested in establishing the different ranks of participants so that we clearly get to know what categories of respondents participated in the study.

Study Objective one: Teacher educators' and teacher trainees' technology knowledge

The first objective aimed at ***nurturing teacher educators' and teacher trainees' technology knowledge using social processes at Makerere University***. To generate data about this objective, the researcher- as a data collection agent together with one teacher trainer and teacher trainees went through an interpretive process (action or participatory process) which was experiential in nature, and we were involved in different interactive teaching/learning exercises

aimed at exposing us to the technology knowledge. Thereafter, we held a focus group discussion to sum up the event and results from the different test items were as follows:

Test Item 1: *social interactions and learning approaches*

This item aimed at establishing from participants, both the teacher trainer and teacher trainees basing on their interactions we had had for over three months how they feel about the experience. If they indeed think this approach (social interaction) can promote learning in a unique way from the traditional teaching method and also to exactly specify the kind of activity that requires technology knowledge to achieve a particular learning objective and to see the difference in knowledge transfer mechanism which seems unique from the traditional teaching/learning approach. Here is what the study found out from the participants;

These social interactions helped both the teacher trainer and the students to learn from one another: *information and knowledge sharing*. Participants indicated that, in online interaction, whatever you want to post, or share is in a soft form, so this simplifies the process and facilitates the speed and mode of information transfer. These social interactions *make learning fun*: In online interaction, not only the teacher was active in communication, but students too were participating fully in the teaching and learning process, for example one participant had this to say; "*Hello Prisca, thanks for sharing with us views on microeconomics; you are indeed grounded in the subject*". This message indicates the sender read and internalized what "*Prisca*" had shared about the subject and they *made learning fun.* This is because Google classroom has a number of tools in which participants explored such as the chartroom where individual learners interacted freely and they indeed felt learning was fun.

This further shows that, social interactions stimulate learner interest and indeed a *source of motivation.* Learning becomes pleasurable when you deal with learners' feelings either directly or indirectly, for example, asking questions to students in a non-hostile way where learning tasks are brought in an easier approach, not exhibiting the strict instructions as applied

in the traditional classrooms, accepting the views of your learners even when not so correct, discussing the right options, referring them to a source of correct answers or alternative sources of information. The other aspect is *offering praises* or *learner encouragement*: even when a learner gives a wrong answer, the nature of response given has a major impact on learner achievement, for example, when the response is negative, such as poor, very bad, there is a likelihood that the learner will lose total morale in learning, but when you for example tell a learner; "tried", "not really bad", "try again" etc, as a way of motivating them, praising or complimenting, telling students why, what they have said or done is valued. When you are encouraging students to continue trying, it gives them confidence, confirming that their answers are not far from the truths, they feel compelled to continue their attempt till when they get the correct answer. Jokes are also good to make learners active and engaged: intentional joking, making learning fun, attempting to be humorous, providing jokes is not at anyone's expense, but of course this is done occasionally.

Test Item 2: ***Google classroom Technology and ability to understand the study content***

In this test item, the researcher wanted to understand the different technology tools from Google classroom which are effective in facilitating study and teaching content. So, after the entire process of learning interaction using Google classroom, participants were able to clearly identify particular technology features of this teaching environment which sounded effective to them in promoting understanding of content:

Presentations: Participants recognized that, it was so helpful to provide visual aids to complement teaching, stimulate discussion, or allow out-of-class teaching. Google classroom allows embedding of power point presentations and other forms of file attachments which makes learning more interactive as learners can go through the study content in bits, that is to say, slide by slide. Participants were asked to exactly explain how the embedded Microsoft power point slides facilitated learning and this is what they had to say; they realized that Microsoft power

point allows proper content structuring which promotes *intuition* and this puts the learner in a positive direction; however this requires planning the presentation structure carefully and according to the general rules of presentations. One participant stated that, "*Since content is not too much on a slide, reading for assimilation becomes simple*". This indicates that, if Microsoft PowerPoint is used professionally and then linked to any online platform like the Google classroom in this case, it can create impact on teaching and learning. The researcher was however, prompted to ask the participants what they valued as critical factor that really made reading simple and these were the responses; not so many sub themes, at least three to five are ok, because this minimizes on the congestion of work per slide and then it keeps the number of slides also few. Participants also talked of other aspects like: colour contrast, font size, line spacing, etc.

***Classroom Response Systems* (*CRS*):** Google classroom has this particular tool which enabled the students to do exercises in several ways, and one of the methods was multiple choice questions. Participants enjoyed Google classroom because of this feature, students would get *immediate feedback*. One way to encourage student-engagement is by using electronic devices that allow students to record their answers to multiple choice questions and instantly display the results. This anonymity encouraged participation, and this kind of feedback enabled them to enjoy learning by also sharing system responses, so, this worked as a motivating factor. The use of *CRS* also served as a catalyst for discussion and indeed promoted active learning, it really fulfilled the constructivist pedagogical assumptions of active learning for effective knowledge construction. Further, CRS *promoted discussion and collaboration amongst the participants during class* with group exercises which required students to discuss and come to a consensus; it *encouraged participation from each and every student in a class*. One participant commented that, this kind of learning helps the shy students also to feel free especially in asking questions.

Collaboration Tools*:** participants observed and appreciated the collaborative environment in the Google classroom because, as a platform, it has got a number of tools which supported *student collaboration* in relation to creating new knowledge, reflecting on what they had learnt, its potential to support team work to achieve a deeper understanding of course material. Note that, Google Classroom combines Google Drive for assignment creation and distribution, Google Docs, Sheets and Slides for writing, Gmail for communication and Google Calendar for scheduling. Students were invited to join a class through a private code, but we could also use the one automatically imported from the domain, so Google classroom has that flexibility. Each class created a separate folder in the respective user's Drive, where the student submitted their class work to be a graded by a trainer/lecturer. The teacher trainer was able to monitor the progress for each student (student supervision). However, we noticed that, sometimes immediate feedback did not provide sufficient details on how a student may improve. So, during our focus group discussion, the researcher asked participants how they perceived the immediate feedback aspect during the study process, and they said that; "feedback most especially from colleagues helped me to understand better", this implies that ***peer learning is important, and it is also an aspect of online social interactions.

Again, in our discussion participants agreed that, effective feedback must be; *appropriate*, that is adjusted to the task that the student has attempted, *credible*, it must be realistic, and not exaggerated, *adequate amount*, it should carefully designed without any positive or negative intensifiers, *descriptive*, implying, feedback must be defining well what students have done and how they have done it without evaluations or prejudice, *proactive***,** it must generate an action that favors repetition and avoids frustration, but also feedback must be *easy to understand*, it should be given in a clear and concise language, based on data, that to say, feedback should be based on the set task objective or work plan and reality.

Archiving courses*:** Google classroom allows instructors to archive courses at the end of the course schedule or semester. Teacher trainers were able to keep (archive) some study materials which were not necessary at a particular point ***t and participants (teacher trainees) commended that the order in which contents are stored under archives in Google classroom was so impressing because these could be retrieved later when needed. So, content is removed from the homepage and placed in the Archived Class area to help teachers/lecturers keep their current classes organized in order leave the platform uncongested. However, when a course is archived, teachers and students can view it, but will not be able to make any changes to it until it is restored. So, this takes us to the connection between teaching environment and learning outcome. When we teach learners from a congested environment, learning or knowledge creation will be limited because the learner's mind is in a mix of things which leads to cognitive dissonance, hence low or no knowledge creation.

***Assignments*:** the major benefit in this feature is basically course work or assignments management; there is no way a student will claim to have done the assignment when he/she does not have any results within the Google's suite. Instead of sharing documents that reside on the student's Google Drive with the teacher, files were hosted on the student's Drive and then submitted for marking. Teacher trainer chose a file that could be treated as a template so that every student could edit their own copy and then turn back in for a grade instead of allowing all students to view, copy, or edit the same document. In this way, students were free to also choose to attach additional documents from their Drive to the assignment. It was therefore realized that online assignments indeed bring exciting curricular where the learner becomes an active knowledge developer. It creates learner centeredness, where learners are given a chance to determine tasks, self-paced, heterogeneous groups, any time-anywhere, active learning and digital resources.

Test Item 3: ***Learner/lecturer engagement for online course units***

The intention of this test item was to find out how online activities can be made attractive so that both teacher and learners keep a continuous interactive cycle. During our discussion, participants (both teacher trainer and trainees) proposed that, both the learner and lecturer must be allowed to personalize or individualize the course (*individualized learning*), for example allow students to place or enroll themselves into the courses. But also, the lecturer should have reasonable control over some learner activities like setting and managing assignments, uploading content to be studied, setting deadlines. Automation on the other hand assists lecturers to monitor students' work remotely because if the date is set and learner fails to submit before the deadline his/her work is not delivered. This trains the candidate in time management and information analysis-ability to interpret content very fast.

Test Item 4: ***Use ICT to carry out discussions with lecturers/students***

Google classroom support assigning group projects to the learners, for example, one of the questions posted for students to discuss in their groups generated a lot of answers and the question was "*is it possible for the prices to remain high despite the high supply of a given commodity, explain*". One respondent "*Tom*" (not real name) on *May 29th, 2019* argued that, "*yes, it's possible for prices to remain high, depending on an inverse relationship between the supply and prices of goods when demand is unchanged. If there is an increase in supply for goods and services while demand remains the same, prices tend to fall to a lower equilibrium price and a higher equilibrium quantity of goods.*" Obviously, a number of views were given by students and it was really an interactive session, and the aim was to see the participants' ability to deliberate matters online.

Test Item 5: ***Information technologies and knowledge application***

Information and communication technologies first of all promote *knowledge management* and under this aspect, the essential point in knowledge management was to ensure

that there was productive knowledge application in online interactions, and this included applying knowledge in problem solving and decision making. During the focus group discussion, participants indicated that; they could download and even insert images, video, and audio clips to support their own *knowledge transfer and application.*

Test Item 6: ***Benefits of gaining ICT knowledge from a friend***

From our social learning interactions respondents expressed a number of benefits gained from learning with friends rather than a formal training: It was revealed that, this approach of learning ICT integration from a colleague encourages *individual or personalized learning*: personalized learning is a *learner-centered* approach whereby; the content, pacing, sequence, technology, learning models, learning spaces, audience and purpose, and any other "learning component" are adjustable according to the knowledge demands, curiosity, genius, and learning purpose of each student. So, individual teacher trainers and trainers benefit from their colleagues from the called informal training or learning, where new ICT knowledge is gained in an indirect way, for example participants learnt how to do online communication for teaching and learning purposes. This approach has the potential to help reduce the stigma of special education and better meet the needs of learners with learning problems.

Discourse analysis: in the first case, discourse analysis refers; meaningful discussion or critical look at something, looking beyond simple matters. So, when the lecturer allowed learners to engage in online discussions, which necessitated the lecturer to give clear instructions and feedback on student work, it encouraged participation of all learners and guided the discussion to the right direction. In fact, discourse analysis was well facilitated by Google classroom, because our online interactions were found of; question-and-answer exchanges focusing on sharing information and personal ideas, defending own position, and rebuttal was very much experienced, finding out "who is right and who is wrong" and "what's wrong with your idea", constructing understanding through argumentation for proper generation of ideas to higher levels, progressive inquiry

whereby engaging in much deeper explanations and emerging questions for continual knowledge improvement.

Collaborative learning: Both the teacher trainer and trainees were involved in a mutual relationship; each recognized the existence of the other in terms of knowledge creation. During ICT training workshops, very often trainers are not very familiar with group of people they are training and hence it is at times hard to ask questions to individuals, whereas if it is a colleague doing the training, usually there is limited fear, and thus increases interactions for collaboration inquiry.

Internet efficacy: Both the teacher trainer and learners were able to appreciate the fact that, learning how to use ICTs from a friend improves one's proficiency and comfort with online environments. The time we have spent on our Google classroom, participants' internet knowledge has been greatly improved, for example, students' ability to search for meaningful content from the internet within a short time.

Connectedness: "*sometimes friends refer us to their friends to learn more about a given concept".* One respondent indicated that, at the end of the day you get connected to different people in search for knowledge, which is an academic advantage.

Test Item 7: *ICT knowledge acquired from social learning interactions*

There is no doubt that Information and Communication Technology (ICT) expands access to education and through ICT, learning can occur anytime and anywhere. The following technology knowledge areas were experienced during our online social interactions with both the teacher trainers and trainees, presented first in a table which gives the basic analysis of the way participants exhibited technology knowledge after the social interactions in terms of level of competence:

Table 4.5: Competence levels of Technology knowledge

Competence level	Technology knowledge	Analysis
Low (*limited understanding of concepts related to ICT knowledge*)	***Judgmental***	Participants could not establish authenticity of most of the information used, but this could have been due to the fact that they did not have the fact check software.
	Negotiation	Limited technology knowledge of handling complex tasks such as switching from one program version to another, programs such as Microsoft Windows and Microsoft office.
Moderate (*Basic understanding and ability to apply basic ICT knowledge*)	***Collective intelligence***	Challenge of making meaningful comparisons of the collected texts or content, and participants did not find it that simple, but after long exposure they attempted to apply.
	Media literacy	Participants did not have major problems in using the learning platform, so there was a fair ability to utilize Google classroom features.
	Civic literacy	Participants were responsible users of the platform and sometimes could make jokes because since we did not want to be very restricted in such a learning environment.
	Content analysis	Participants fairly understood the appropriateness of content.
High (*High level of understanding and ability to interpret how and when to apply technology knowledge*)	***Research***	Study results imply participants were already used to this already and it can still go on minus digital devices, so that is why they exhibited high competence level of technology knowledge.
	Distributed cognition	Since participants were guided, they carefully and reasonably attended to the various academic activities on the platform; they raised meaningful questions and answers.

Content analysis: this is technology knowledge where the participants were able to analyze the content that was worth for their online learning interactions; very precise, able to rephrase the

study materials and identify critical tasks for learning purposes. It is always a polite way to desist from sending a reply to the question when you do not know the correct answer, so this requires thorough analysis of what one intends to post before the actual posting. This has reflected several advantages for the learners; online participants develop confidence, and also as learners they gain credibility and more critical thinking resulting from content analysis. How does this then connect to technology or ICT, it must be noted first of all that, information technology is so broad with numerous tools which can be used to analyze content such as grammatical checkups, spellings, paraphrasing, appreciation of content by citing relevant source and extra. All these require an understanding of working with soft copies to a certain level, and thus this is what we have called, content analysis. However, some participants found it hard to analyze the content, especially the appropriateness of what to post on the platform.

Research knowledge: Respondents employed a range of strategies to search the internet to get answers to the given tasks, this called for knowledge and ability to make choice about the correct sites to go to. These strategies varied in their effectiveness and in some cases the complete lack of how internet works for example, server/client relationship, domain names, and address protocols extra. But later, respondents gained some insights and confidence on the most effective internet strategies. Respondents tended to stick to one search engine with which they were familiar (Google). Most of the respondents experienced some sort of technical problems such as, low speed of the internet, intermittent connectivity and they generally felt ill equipped at first, but later they were able to manage and sort out the problems refreshing pages in some cases or identifying a better internet browser. Online social interactions promoted research knowledge as learners sought for answers to respond to their colleagues in the discussion group, they consulted from the different web pages and as a result they were able to gain the necessary knowledge of identifying which pages offered authentic information. Participants' technology knowledge in internet use could be attributed to the fact that, these students have been always doing take home course works which

might require research, so using ICT was just enrichment, but they already had ability of doing research.

Civic Literacy- The teacher trainer as well as teacher trainees who had very limited knowledge gained some digital knowledge in form of understanding how and when to apply ICT in teaching/ learning. Teacher trainees on the other hand participated effectively in civic life, i.e., exercising the rights and obligations of citizenship, responsible users of the platform. During the social interaction process, learners did not post anything outside the areas of concentration; this indeed was a sign digital maturity (civic literacy). ***Media Literacy***, teacher educator as well as the learners were able to understand how and why a certain post had been constructed; ability to *create media* products and to utilize the most appropriate media creation tools, characteristics, and conventions. ***Distributed cognition***: this refers to the ability to attend to the various academic activities carefully and reasonably, ask meaningful questions or give genuine answers to the learners. So, during our social interactions, the teacher trainer as well as trainees gained ability to interact on a learning platform about various concepts using the various tools on the platform and properly answered questions and were again able to provide feedback to each other. This ability of the teacher trainer and some learners to use Google classroom in various ways for example to; post a question, give, and answer, give a comment, provided feedback, set calendar dates or set deadlines, posted image/video, downloaded content from a given webpage, edited and saved within a short time which the researcher referred to as distributed cognition.

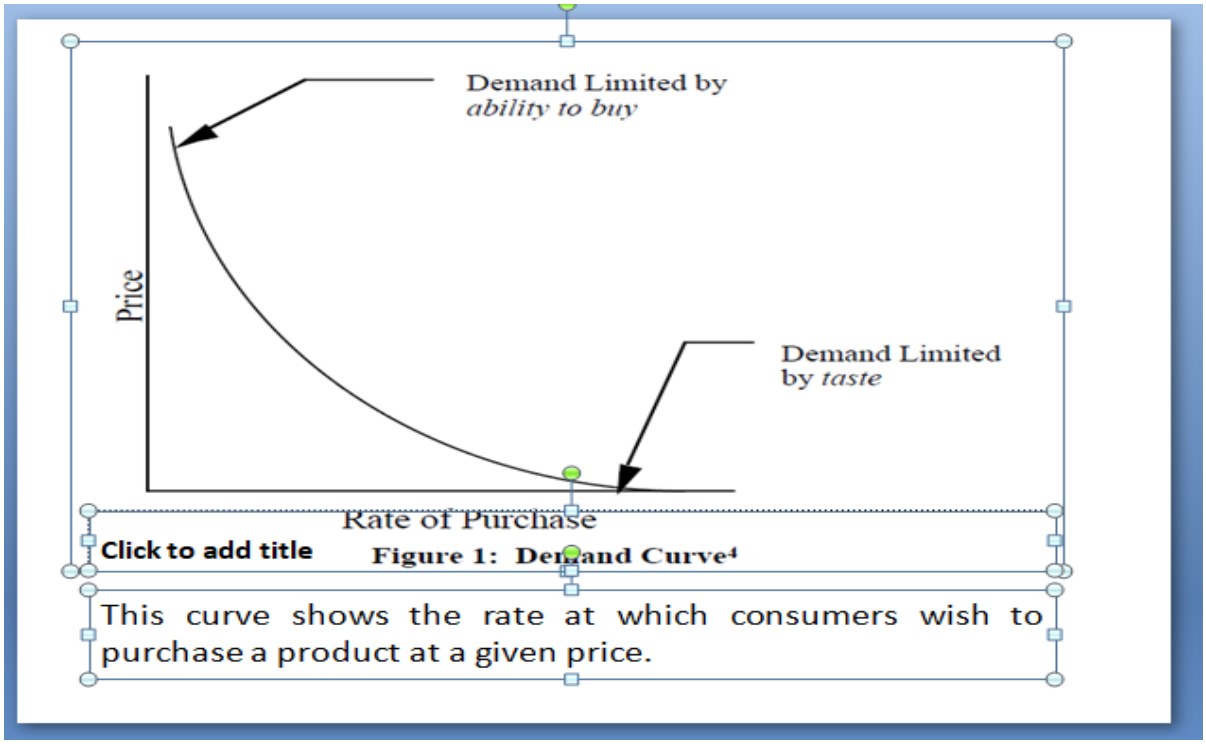
Collective intelligence: this refers to the ability to gather and compare notes from the different sources and summarize them. The teacher trainer was able to identify different sources of information mostly online materials, made comparative analysis on the teaching materials before sending them to the trainees. ***Judgment*:** Participants could not establish authenticity of most of the information used, but this could have been due to the fact that they did not have the fact check software. Most of our learners are just used to simple Google search engine, there are a number of

fake pages which provide wrong information about certain aspects, so participants were indeed not aware of such, take an example, IP(internet protocol), URL (universal or uniform resource locator) DNS (domain name system), communication language such as; FTP (file transfer protocol), HTTP (hyper text transfer protocol) etc are some basic technology knowledge one would require to properly function with internet searching; genuine web pages will start with say: https://www but not http://www. Little did the participants know all about this, but they could ably search for information especially using the Google search engine.

Negotiation: concerns the ability to reason out on complex tasks, this it could be attributed to the fact that, today many learners want to get all answers from the internet, so availability of internet however good it might be, it has created gaps in individual learners' reasoning, simply because we do assume, all answers are accessible online. For example, updating use from one device to another, upgrading from a lower version of program to another. Sometimes, it required users to access the platform on different computers using different programs or versions such as windows and office applications, it was a great challenge. Many participants exhibited very limited negotiation knowledge, very few could even differentiate major operating systems from Microsoft office application and thus this limited their knowledge of setting the required knowledge update of switching the different program versions. **Photo-visual literacy:** participants gained multimedia integration, ability to use of images and pictures that are representative enough to bring out the meaning of the intended concept under explanation. They were able to understand visual representations in online environments and were able to interpret the message from graphical displays. Very often while using computers to deliver some information to an audience by use of images, it is a bit cumbersome, and many people are not familiar with the correct approach; when, where and how to place an image or picture in a presentation, this requires photo-visual literacy. In the study, individual participants gained knowledge of the sort, if you are placing an image in a presentation, there are basically two approaches used:

Approach I: picture with caption: This is when the image or intended picture covers the entire slide, in some cases it is a descriptive image, that is to say, an image containing some descriptive words within, this stands on its own full slide and some other few additional words are put below the title but in a separate box (where there is *click to add text*) as indicated below;

Figure 4.1 Photo-visual literacy: Picture with caption



Source: Primary data 2019

In this first approach, it implies, the presenter is confident that the image is descriptive enough whereby it requires no, or just minor additional explanation and that little explanation is what we put as an additional at the bottom of the slide. *Approach II: content with caption:* This is where an individual presents content first **(***left side of the slide***)** and then image follows the content **(***to the right-hand side of the slide***)** as indicated below:

Figure 4.2: Photo-visual literacy: Content with caption

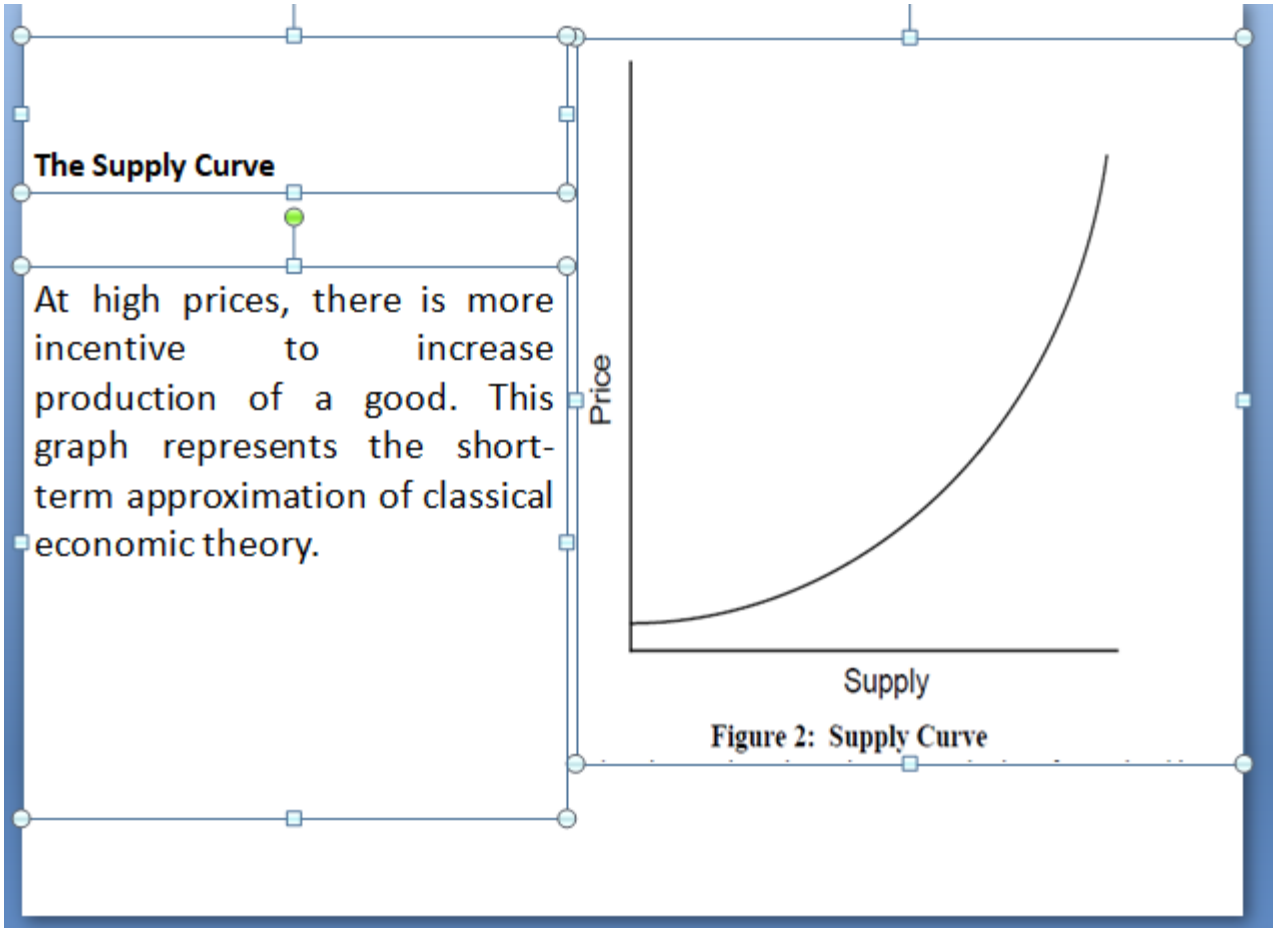


Figure 2: Supply Curve

Source: Primary data 2019

In this second approach, the image is aimed at ascertaining what has been stated in the content on the left-hand side of the slide, so the image becomes an additional emphasis; that is why in this case, the image is not that elaborative, such an image is supposed to be placed on the right-hand side of the side.

Study Objective two: Teacher-educators' and teacher trainees' technology skills

The second objective aimed at *nurturing teacher educators' and teacher trainees' technology skills using social processes at Makerere University*. To generate data about this objective after the social interactive process with the teacher trainer and trainees, the researcher, as a data collection agent, the teacher trainer and teacher trainees had a focus group discussion to sum up the event which had lasted for four weeks and results from the different test items were as follows:

Test Item 1: ***Social interactions amongst students***

First, participants unanimously accepted that, to communicate effectively with others, establish friendships, positive social relationships, and be perceived as a likable human being, a person must demonstrate good competence (digital skills**).** Social interactions amongst students who are knowledgeable and those who are not knowledgeable in ICT can promote ICT skills, how; through the sharing process, it enables students to learn how to use the different platforms for communicating the information or content. So, it becomes a requirement that, to share the little they know with other students get conversant in using the communication channel. Typing is a requirement: as a result, learners were able to gain typing skills and how to edit information. On the other hand, participants had to exchange some videos and audio, so in the process they advanced in video and audio processing. Learners were also encouraged to use images or graphics where necessary to minimize on words, and in the end, they became skilled in image editing and processing. In the due course, participants also gained skills of software upgrade and installation especially a colleague posted a file in a program one lacks. For example, one student teacher trainee indicated, "*I did not have Microsoft office on my phone, but Emma sent me a power point presentation, so I had to download and install power point".* Another participant said, *"I did not have OTT (over the top tax) but I was missing the group forum post, so I called Prisca and she directed me on how to download and install VPN (virtual private network)".* So, all these facts are indicators that, students and learners do not always need official training in ICTs, but a lot can be learnt from colleagues and that is what social constructivist approach is up to.

Test Item 2: ***University support to promote the necessary ICT skills***

In the focus group discussion, participants were asked to explain clearly *how The University can support students/ lecturers to acquire the necessary ICT skills.* The different opinions were aggregated into the following views;

Policies: Participants suggested that, the University can set up policies that guide integration. For example, provision of tools needed for integration, such as; laptops for students, in conjunction with other stakeholders, students can be provided with laptops and they pay in installments.

Internet access: the University needs to widen Wi-Fi access point so that students have internet connectivity throughout the Institution, including their halls of residence. This will enable students to continue working on their projects and carry on their interactions from all corners all the time.

Technical guidance: Participants believed that, successful ICT integration in teaching and learning requires some sort of support from a more qualified person. However much students and lecturers can learn from one another, sometimes there are technical problems which need knowledge of an I.T expert and they cited examples of; lack of connectivity (advanced troubleshooting), special software installation and upgrades, etc.

Test Item 3: ***Enhancing learning interactions amongst teachers and students***

Curriculum design and development: The teacher trainer indicated that, "*the University needs to think of integrating end-user ICT skills within the curriculum design and development*". This will enable teaching and assessing such ICT skills within the subject area. *Training*: The teacher trainer also advised that, for such social learning interactions to make a meaning, the University needs to mark policies related to ICT training to both teacher trainers and students in ICT integration and if possible the University can make partnerships with other universities outside Uganda which have already moved a step in ICT integration. This will enable trainers and trainees to be aware of what is expected of them with respect to end-user ICT skills. However, *in-house training* can be also very useful whereby the University can also think of creating more in-house training seminars and workshops for the purpose of delivering updates as to enhance ICT trainers' effectiveness.

Infrastructure: the University needs to think of ensuring that, ICT infrastructure and facilities, ICT training materials and qualified workforce are in place as to support teaching and

learning using ICT. For example, there is need to have sufficient space, computers, network connectivity, smart boards and necessary software, on standby generator etc, to support teaching and learning activities. **Create awareness**: Teacher trainers need to be informed of such ICT training programmes which educate the University community about the importance of end-user ICT skills. So staff can be updated through; emails, posters, stickers and newsletters, etc.

Test Item 4: ***Social media platforms suitable for promoting Information Technology skills***

The following test item aimed at establishing the participants' perception about the different social media platforms in influencing the teaching and learning process. Social media first of all was considered a key tool in facilitating teaching and learning. Participants looked at Social media use in education as the use of online social media platforms in academic settings such as university education. The following social media platforms were mentioned during our focus group discussion; *Face book*: participants indicated that, using Face book allows for both *synchronous* (time-dependent communications such as a telephone call whereby parties to communication need to be available at the same time) and *asynchronous* (is communication that can be sent at any time without need for the sender and receiver to be time-synchronized such as emails). The students indicated that, this platform allows students to ask more minor questions that they might not otherwise feel motivated to visit a lecturer in person during office hours. Face book can helps students in self-expression and encourage more frequent student-and-instructor and student-and-student communication. In the due course, these students gain typing skills, especially in improving the speed. *Twitter:* Twitter is an American online news and social networking service on which users post and interact with messages known as "tweets". Participants indicated that, twitter enhances communication building and critical thinking, thus they build their computer skills as they are engaged in exchange of messages (tweets). The teacher trainer also reported that, twitter can promote critical thinking because students engage in online classroom discussions.

*YouTube**:*** regarding this application, respondents reported that, *"it is the most interesting social media platform because students can watch videos, answer questions, and discuss content and students can create videos and share their own content with one another in either audio or video format"*. YouTube increases participation, personalization (customization), and productivity. YouTube also improves students' digital skills and provides the opportunity for peer learning and problem solving because videos keep students' attention, generates interest in the subject, and clarifies course content. Additionally, students reported that these videos help them to recall information and visualize real world applications of course concepts. *WhatsApp:* This is a cross-platform for instant messaging client on smart phones, PCs and tablets. The app relies on the Internet to send images, texts, documents, audio and video messages to other users that have the app installed on their devices. Students and the lecturer very much supported the use of the application because of its simple management facility, easy to install, auto upgrading but most interestingly the continued live (synchronous) mode, "*we have some group WhatsApp, but not mainly for learning purposes, basically coordination"*, one participant reported. This application has wonderful feature for both synchronous and asynchronous communication. ***Instagram:*** This is visual social media platform, much as this platform also allows posting of videos and photos, very few respondents were knowledgeable of this platform. Those who have used it reported that said, it is limited to only for mobile use through application. "*I have never heard about it even*", one respondent said. But there are other social media platforms which can promote learner interactions and create impact in promoting technology skills.

Test Item 5: ***ICT skills gained from social interactions***

This test item was aimed at establishing the different ICT skills which participants attained from the interactive process, so presented first in a table which gives the basic analysis of the way

participants exhibited technology knowledge after the social interactions in terms of level of competence:

Table 4.6: Competence levels of Technology skills

Competence level	Technology skills	Analysis
Low (*limited understanding of concepts related to ICT skills*)	*Data management*	Many participants had a big problem with file management, file types and retrieval.
	Problem solving	Conventional and innovative ways of handing complicated matters was a major problem.
	Critical thinking	Ability to analyze information objectively was challenging.
Moderate (*Basic understanding and ability to apply basic ICT skills*)	*Creativity*	Participants gained some new techniques which they used in handling some technical tasks, although not with a lot of ease.
	Multitasking	Participants had moderate potential to manipulate a number of tasks at ago.
	Networking	Participants through their social interactions were able to gain the skills of connecting digital devices to the internet
	Information presentation	Learners exhibited high level of presenting information to an extent that some would use professional programs like Microsoft power point.
High (*High level of understanding and ability to interpret how and when to apply technology skills*)	*Communication*	Participants ably sent messages to fellow participants using the different channels using appropriate language.
	Information Literacy	Participants generated and managed the flow of information during their group discussions.
	Self-direction	Self investigation was mastered; learners were able to get answers on their own.
	Collaborative	As a result of team or group interactions, participants ably worked effectively and respectfully with diverse other members.
	Appropriation	Participants had a lot of ability to construct meaningful content

Information presentation: Since, the study was interactive in nature, it required all participants to present some sort of information to the group, hence identifying content and putting it in the right form for presentation. So, some participants would use programs like Microsoft word,

Micro Soft power point to present their work to the group, but there are several power point presentations which really looked professional, whereas there are those who would post directly to the classroom platform. ***Networking skills***: Increased practical computer skills on how networks work, connecting devices to internet. Participants through their social interactions were able to gain the skills of connecting digital devices to the internet. For example, participants' ability to recognize what to do when the device is not connecting to internet such as data enabler tool from the smart phones. Checking for proper fixing of the cables or resetting the Wi-Fi passwords are some of the basic networking skills that participants gained some simple network troubleshooting during this period of study. However, this was not a simple skill especially where at times people forgot their access codes, it was trouble but through consultation we solved such matters.

Data management skills*:* Participants had a big problem with file management, basically file types and retrieval systems. Even though, social interactions increase learning abilities, teacher trainer and trainees' potential to create, organize and store information in a digital form most especially information they had downloaded from the internet was a bit challenging most especially the file types and locations. Participants had a big problem with the different file types but most likely this could be linked to lack of negotiation knowledge. Since participants had limited knowledge of information management, they could hardly establish the right file formats for online interactions, so this could be the reason to why also when it comes to data management learners found it a bit challenging. For example, using the Google drive to save information, hard to retrieve their stored data; ability to trace file from the different storage locations was indeed a challenge. ***Communication skills***: through digital devices, participants were able to retrieve and send information like emails, chats, articulation of issues and ability to make an argument etc and the researcher linked this to the learners' familiarity with technology. ***Self-direction skills***-digital technologies provided the learners with the skills of self investigation; some tasks would prompt

participants to look out for answers on their own, this is one of the major benefits of ICT, they promote individual effort, promote independent learning, hence a sense of self direction.

Appropriation: ability to construct meaningful content. Since learners were assigned tasks as individuals or groups, they are able to generate meaning content to be shared on the platform. ***Creativity*****:** participants gained new techniques which they used in handling tasks, colours, use of meaningful images and illustrations to emphasize a point particular aspects, although this was one of the hardest skills, because even when it comes to use of colours, some participants would at the end of the day mix up which colour would mean good or bad, take an example of red colour, not suitable for text unless giving a warning, so you would find that at times these participants would mix these colours up. Sometimes even use of illustrations to explain a point, these at times would not bring out the point clearly, for example if asked to explain with an illustration to explain the effect of demand on supply minus using the usual demand curve, many participants would find it really complicated even in their groups, this reflected that the old learning fashion was not obvious to delete from their brains. ***Collaborative skills:*** participants ably worked effectively and respectfully with diverse teams of other members on the platform which in the end promoted their collaborative skills.

Problem solving skills: ability to solve different kinds of non-familiar problems in both conventional and innovative ways, through a technological device and program. This was complicated for our participants, both the teacher trainer and trainees, many participants found it hard even after interactions to solve some technical problems on their own. For example, sometimes some participants would attempt sending files that exceed maximum capacity and through interactions they could come up with a solution of either compressing the file or changing the file type to reduce the weight of the file, but this was not an easy task. Connectivity problems, respondents would be able to understand why there is loss of network and were able to reconnect. ***Critical thinking:*** This refers to the ability to analyze information objectively and make a reasoned

judgment. Critical thinking involves the evaluation of sources such as data, facts, observable phenomenon, and research findings. Good critical thinkers can draw reasonable conclusions from a set of information and discriminate between useful and less useful details to solve a problem or make a decision. Participants' ability to analyze and reason out before posting an answer, and so, we realized that there are skills which are innate, not just trainable and critical thinking is one of them.

Information Literacy skills: students and teacher trainers can access and evaluate information critically and competently, so the participants were indeed able to generate and manage the flow of information from different individuals on the group. ***Multitasking*:** ability to manipulate a number of tasks at ago. Learners were able to read and interact with various individuals on the platform as well as ability to extract content from different folders, attach files, working with different programs at ago. So, a person was able to perform various tasks using the same communicative device at ago. Although we notice that, technology knowledge such judgment and negotiation are very fundamental in promoting management, problem solving and critical thinking skills. Reason to why participants were lowly in the above technology skills is just because they did not possess the necessary technology knowledge and this is in assumption that, many of our learners today have resorted to receiving all answers to complex tasks from the internet. So, this has therefore limited learners' analytical potential to reason independently.

Study Objective Three: Cultural processes and technology knowledge and skills

Introduction

Study objective three aimed at establishing the extent to which cultural processes promote teacher-educators' technology knowledge and skills in teaching at Makerere University, and data were collected from teacher educators only from School of Education across the different academic departments using an Interview Guide (***see Appendix B***).

Test Item 1: Teacher educators' attitude towards use of ICT in teaching

In an interaction with teacher educators in the different Departments, it was revealed that, they understand the concept of ICT integration, and in our discussion, these teacher trainers indeed understand technology knowledge and skills, for example I quote, "*when I use the computer I can easily communicate to the entire class with just one single message*", and again the teacher educator reported that, "*actually you can easily make any changes in the creation*", the teacher educators realized that, while teaching through ICT, it improves learners ability to do tasks as reported, *"ICT allows learners to work in groups and this promotes knowledge creation resulting from individual and group actions".* Again, the teacher trainers through sharing with their learners were able to notice the particular areas that can easily be supported by ICT for example, developing content, giving coursework, submissions, and feedback. In the process of this study findings revealed that, many lecturers embrace ICT integration, and they positively believe that if well applied in teaching, it can promote better learning outcomes.

However, findings also revealed that, there are some teacher trainers who think ICT integration is wastage of time, thus reflecting a negative. Such lecturers simply assumed that ICT integration requires a lot of time to prepare the teaching materials, a point that might be true at the beginning but in the long run, it becomes easier especially when it comes to updating and enriching the teaching materials. So, the teacher trainers who perceived ICT integration negatively, had low levels of use, because their attitude affected their energy to develop and work with ICT. But you will realize that some teacher trainers who perceived ICT use negatively are just rigid, changing from teacher-centered to learner centered approach is still bothering their mind, many educators still want to teach the way they were taught despite the fact the knowledge is not constant, but rather a dynamic concept.

Test Item 2: **ICT background**

Information and communication technology background promotes technology skills and knowledge for integration. Since ICT has become a tool to be used almost in all spheres of life, many people have gained some training at a certain level, whereas there are those who never got a chance but instead, they have learnt how to use these gadgets individually to help them manage their routine activities. Findings show that, teacher trainers who already had some ICT knowledge and skills found it much easier to integrate it in their teaching activities, compared to their counterparts who never had any exposure to ICT. For example one participant commented, "*I have had several trainings in computer, so I do not think I can manage any office work including teaching without a computer*", then another one said, "*how would one make teaching materials minus a computer*", these responses meant that, there are those who are used to using computers in teaching because they have computer background, whereas there are also those trying to get on board slowly through sharing experiences with other knowledgeable colleagues.

One teacher educator, lamented, "*Some of us are beginning to migrate from analogue to digital, so we have no choice, I bought a laptop, and I am catching up slowly*". This information concerns all teacher educators and trainees, we understand now ICT in teaching can never be exonerated, in fact in many secondary schools in here in Uganda where we send our teacher trainees ICT knowledge and skills are compulsory. Teachers are now requested to upload their teaching notes on to the; Google classroom, so the teachers we are producing must be digitally competent if they are aiming at serving the digital natives of today. And if these teacher trainees can start now to use these ICTs during their training, then we can cultivate ICT integration and development of the required ICT knowledge and skills.

Test Item 3: Academic disciplinary/subject specialty

Study findings indicated that, Foundation and Curriculum Studies Department exhibited very highest levels of ICT integration, and this could be attributed to the fact that, curriculum studies involve the development of teaching aids, and ICT has the most modern and suitable teaching tools for developing such teaching aids, like use of simulations and animations, presentation, which lecturers may adopt in managing courses like educational technology. Similarly, Science Technical and Vocational Education also indicated that they apply ICTs to manage several subjects like; mathematics, physics and chemistry to present content also using; power point program, simulations, animations and they pronounce that actually this ICT has simplified the teaching of these practical areas. One respondent stated that; "*subjects like biology; we have used videos to easily make illustrations for our learners*".

Humanities and Language Education on the other hand have also greatly labored a lot to apply certain ICTs in teaching; actually, there are those lecturers who have made great use of online learning management system (*MUELE*). Some teacher trainers have developed their subject curriculum in a very impressing way, where almost full learning activities are managed on-line. However, in the same Department, a number of people here were still struggling with technology,

they cannot use online platforms, but at least they have made great effort to gain confidence and competence in using presentations and projectors. But there are still a few teacher trainers who unfortunately still believe that they have limited areas for ICT application. An example, one teacher trainer reported that, "*my course units are not practical in nature; therefore, I do not find great need of using ICT equipment, however sometimes I send work on students' group mails*". This effort can also be appreciated, because it indicates that, much as someone may not be an advanced user of ICT, there is effort to use some tools to simplify learning.

So, discipline priorities and needs to some level may dictate the application of ICT in teaching and learning. So, it implies that, some teacher trainers still think that, some subjects can easily call for application of ICTs especially those that are practical in nature such as Biology, Physics, chemistry etc, however, today when we talk of ICT integration, it does not matter the type of subject, all subjects can be well facilitated with a certain ICT, so our role is to establish which particular ICT type or tool is suitable to a particular subject.

Test Item 4: curriculum design and development

ICT integration becomes successful when the curriculum clearly indicates where and when to apply a certain ICT to manage the teaching content. In this way, the designed curriculum should fundamentally support teacher trainers' acquisition of technology knowledge and skills. Study findings revealed that, many of the teacher trainers find themselves at a certain point using a certain technology. I received a comment from one of the participants, "t*here are at times when I feel like I have time, so I develop a power point presentation",* it means such a technology choice was not initially part of his/her delivery approach, but only happens when the lecturer has time. This is an indication that, while designing curriculum, the specific ICTs required to deliver a course are not mentioned, neither to we include in our delivery mode, the form of tools required to handle a particular section or unit.

Another respondent stated that, "*our students are used to hand outs and photocopiers, so I print notes and put at the photocopy*", well, this person cannot be undermined because at least will print some notes, it means at some level does the preparation of content through the computer, but look at the point of delivering these notes, we need to start thinking of delivering these notes in a cheaper way to the learners, softcopies and the learner is free to convert it to hard form. This way, the teacher trainer gains more technology knowledge and skills, for example; setting text format/type, because to choose a file type, you must first of know which type and why, for instance if you intend to leave the file in Microsoft Word, which file type should be taken up and why (***technology knowledge***), should it remain in Word Document for example, but then at the back of your mind you must know that some of your learners may be using a lower version of Micro soft office and hence the file will not open up; should be a rich text format, why, putting it in mind that this file type will now become heavy as compared to a plain text. So, these are some of the specifications supposed to be laid down within the course outlines to avoid inconveniences on both sides of the teacher and the learner.

Test Item 5: ICT Policies

The researcher took an initiative to investigate the extent to which the institutional ICT policies also may promote teacher educators' technology knowledge and skills and from the interviews with academic staff, a lot of information was revealed: in the first place, the researcher found out that, many academic staff are not aware of any ICT policy, actually someone told me, "ICT policies remain with those who implement them", I got concerned with this issue, but then I asked farther whether the lecturer was aware of guidelines perhaps regarding the use of ICT facilities, but then the response was, "*what sort of facilities, the internet* ?", and I think this was on the basis that each academic staff seems to mind about purchasing his/her ICT equipment, such as; laptops, projectors, printer etc. And it becomes very hard to put in place any user guidelines when the equipment is personal. So, the idea whether the current ICT policies in the University promote

teacher trainers' acquisition of technology knowledge and skills was really challenging because when the teacher trainers are not issued with any guidelines, it becomes hard to make an input, however, members who have used technology in classroom very often do not have any guidelines, but individual creativity.

However, the researcher was compelled to find out the respondents' on how ICT policies in the University should be managed or improved if they are to create any impact on ICT integration skills and knowledge, and the following responses were given; ICT integration should be part of the teacher training curriculum and there should be some policy guidelines on this, management needs to put in place continuous effective and efficient training of teacher trainers in the use of ICT, teacher trainers should be trained in the emerging technologies, there should be a course strictly in the use of ICT in teaching for all teacher educators, prioritize the installation of new and up-to-date ICT facilities such as Wi-Fi and related ICT accessories, facilities like projectors should be installed in all lecture and seminar rooms and there should be procedures and guidelines regarding their utilization.

The University may also consider giving a laptop to each and every teacher trainer, lecturer rooms should be well connected to internet and also power installations to allow students use their laptops, Top down approach has failed, could try the bottom up approach, let the teachers identify what ICTs they need to use, on time technical support is needed especially for ***MUELE***, all courses to be put online as a must and assessment of course outlines to be done online, stakeholder based policy development where the students are consulted to own up the ICT policies, leadership should embrace ICT in their daily activities of processing and keeping staff data especially on payments, lecturers should be provided with modern computers in their offices basically for teaching purposes.

There are so many gaps in the current ICT structure, these should be filled first, the policies should emphasize the possession of ICT gadgets by both students and lecturers, ICT/ computer

application should become a cross cutting compulsory course unit to all students in the University, participants also noted that Smart boards need to be fixed because they are good in creating an interactive teaching/learning environment and then, The University should make a follow up on the implementation of the policies rather than developing them and then do not implement them. Most of the proposals were more on setting facilities to be accompanied with clear user guidelines, but also the aspect of usability came out from many respondents, that there is need of technology integration guidelines.

Leadership

Based on literature review the researcher was compelled to investigate the extent to which leadership styles promoted ICT integration knowledge and skills, and emphasis was on the following: authoritative, distributed, transactional and transformational leadership styles. After a briefing about these different leadership styles, the researcher asked the teacher trainers for most suitable style in promoting innovations such as technology integration in teaching and learning, and from the responses, majority suggested a transformational leadership style. On the other hand, these respondents indicated that, authoritative leadership style is more common within the University administration. However, authoritative leadership style is not a critical success factor for technology knowledge and skills; hence University management can easily revise its leadership mechanism and employ management styles which promote development. This implies that, if a particular leadership style contributes to the promotion of teacher educators' and trainees' technology knowledge and skills; it might be the reason why there is a slow uptake of ICT integration in teaching, and perhaps the way University mangers approach the matter leaves a lot to be desired.

Study Observations

Participants were able to: manage information which involved: creating files and folders, Store, locate, organize, downloading journals and textbooks, transferring information from internet,

saving in intended locations, and retrieving data or files; however, under information management, the concept of file type was very challenging, because this would determine whether the information shared will be accessible by all parties using different versions of a given program. For instance, some participants had laptops installed with Microsoft office 2010, 2013 and above whereas others were using office versions below 2010. One participant used a save as type; power point presentation, and then upon sharing the presentation, some other users with lower Microsoft office version, could be seen, but could not open. So, this was a bit hard to understand, till when the more knowledgeable ICT users went into a session and labored to guide the low-level users, so explained that; usually with computer technology, the principle is; old technology does not read newer technology whereas the reverse is true.

While saving a file for example in Microsoft power point, the best file type therefore would be power point 97-2003 presentation, and this can now be shared by all people using different version of the program, because this is a compatible mode to all computers. But this is a concept to do with technology knowledge application, but it so happens that, many computer users have skills with some technology knowledge gap, take an example of file storage, many users are good with the skills of saving, but if you ask someone to distinguish primary and secondary storage, it becomes hard to explain, so this implies that an individual can easily gain some computer skills through trial and error, but then misses out on the side of technology knowledge, but during the social interactions, both technology skills and knowledge can be attained.

Participants' communication improved in the due process: sending and receiving messages online, telephoning over the internet/video calls (via webcam), participating in social networks and posting messages to the chat room. However, file management most especially the size in some cases was a challenge to many trainees; for example, one would capture a very length video, exceeding the maximum kilobytes/bytes to be transmitted on a given platform. Content creation was generally an easier concept, most especially with compiling some notes on a given theme,

formatting and editing, using copy and paste tools to duplicate or move information within a document, creating electronic presentations with presentation software e.g. slides, including e.g. images, sound, video, what is called, multimedia, uploading content on internet.

Although both the teacher trainer and trainees found it hard to create presentations that are interactive in nature, much as the more knowledgeable user attempted to take them through; Problem solving like: connecting and installing new devices like phones to computers, installing a new or replacing programs such as upgrading from internet explorer to chrome, connecting to internet using Wi-Fi (wireless fidelity), especially on smart phones, but not on the computers, simply because they are more familiar with phones than computers. You will realize that, when it comes to problem solving with use ICT, the teacher trainees found it a bit difficult, but they could try to update some programs especially on their smart phones; issues to do with: connecting and installing new devices, installing new or replacing programs, connecting to internet using Wi-Fi (wireless fidelity) etc. This could be attributed to the fact that, ICT has a bigger advantage in solving practical problems and because of the imbedded instructions, learners can always interact to get clear interpretation of any feedback message in case of an error, but secondly with the availability of internet, new computer users find it easy to always seek for some support from the internet. Thirdly, digital natives, these young learners we are teaching today have had a lot of time with technology, most of the teacher trainees we have today are between 18-22 years, meaning they were born in around 2000, so by the time they were 13 years of joining secondary schools in around 2013, such learners have had a lot of time to explorer modern technologies and most especially smart phone technologies, and so they tend to exhibit high levels of technology integration in their routine activities.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This Chapter deals with the discussion of the study findings, draws conclusions based on the discussion per objective and presents the study recommendations.

Teacher-educators' and teacher trainees' technology knowledge

Technology knowledge competence means teacher educators' and trainees' ability to understand how particular ICTs can be used interactively to promote teaching and learning, this comes before gaining skills, it is therefore an individual's awareness and great insights of the ways in which an individual can make use of available technologies to facilitate teaching and learning. Several studies as literature indicates in chapter two that, learning takes place through social interactions and this study looked at how these social interactions can promote teacher educators' and trainees' technology knowledge because they are the driving force behind interactions.

Information Technology tools and programs require knowledge from the users which can be gained through social interactions on a customized learning management system such as *MUELE* for Makerere University or any other free online platform such as Google classroom. The study findings revealed several advantages gained from social interactions using ICT tools such as personalized learning, curiosity, fun, motivation, and other aspects. But to the greatest advantage, when teacher and learners socially interact through information technology, then this promotes, *discourse analysis, collaborative learning, Internet efficacy, personality traits.* In such an environment ICT triggers constructivist innovation in the classroom thus leading to the realization of meaningful authentic, active-reflective, and problem-based learning, a method that challenges students to "learn how to learn", students seek solutions to real world problems. In the same line, Ghasemi and Hashemi (2011) found out that, learner interactions can easily be promoted by using Information technology, because ICT promotes; information access, allows the learner to

select and interpret information, review and modify their work to improve the quality through computer programs such Microsoft word, share the work with others or communicate with others through internet and in the end this allows both teachers and learners to evaluate their work, improve efficiency, and become more creative and take risks, gain confidence and independence. This implies that, teachers who make use of information technology in their classrooms to enable learner interactions they are also taking up the opportunity created by these technologies to provide dynamic learning environments since knowledge is never constant, the study environments must fit into the learners' status, which in the end contributes to the learner's potential to generate knowledge.

Effective interactions through Information Technology support individualized learning and it allows all students to study at their own pace, but it also gives them the chance of sharing the gained knowledge with others, thus encouraging all participants to enrich their ICT knowledge to fit in the group. And if effectively applied, the gained information technology knowledge does not only increase student learning, understanding and achievement, but also augments motivation to learn, encourages collaborative learning, and supports the development of critical thinking and problem-solving skills. This is again in agreement with Hughes (2005) who indicates that, if social interactions are well coordinated, they require users to apply information technology, which ICT in the end has the potential to provide innovative educational opportunities by supporting the reorganization of students' cognitive processes and problem-solving activities especially when they solve problems through group collaborations. However, he argues that information technology knowledge alone does not suffice ICT integration in teaching and learning, it calls for proper; technology, pedagogy, and the content knowledge which trio can be attained through social interactions.

The study findings indicated that; when learners interact with their teacher through Google classrooms, they share responsibility whereby, everyone takes initiative of giving a response to the

task at hand in a group, actually they even become so eager to do the assignments because of group motivation. Participants indicated because learning is online it is easier to share softcopies of their work, hence, it simplifies the process of exchanging information and this gives them the opportunity of gaining more knowledge about data and information management. On the other hand, social interactions make learning fun, since these are digital natives, if they are given any learning task through a digital device; it creates some form of enjoyment. These digital natives are not confined to classroom facility (building), they want to study while cracking jokes with colleagues online, they prefer to study while listening to some soft or cool music, so this is the new generation and that is their learning style. In support of the study findings, Plowman et al. (2010) found out that, in the UK, almost all children aged three and four are growing up in homes which have a wide range of technologies which they use to interact with one another, and it is these technologies they would want to use even in their classroom work, such as the iPad, smart phones, televisions, radios etc. This implies that, since the current generation of learners is used to these ICTs, it is imperative that teachers also gain the technology knowledge to continuously support learner interactions to generate deeper understanding of the study content.

Social interactions support individual teachers and students to gain Information and communication technology knowledge because these ICT promotes discussions, it makes the learning process more interesting because through ICT tools learners can make chats which make learning a flexible process. This study identified several tools from Google classroom which can promote learners' ability to understand the study content in a more exciting way; *Classroom Response Systems* **(***CRS*): this tool encourages student engagement because it allows students to record their answers in audio form which makes the exercise exciting and fun. *Collaboration Tools*: Google classroom supports learner collaboration through chartroom and Google Calendar for scheduling. We can create a separate folder for each class or group in the respective user's Drive, where the student can submit work to be a graded by a teacher. Zaidieh (2012) also

agrees that learning platforms have features which promote social interactions and thus learners construct their own knowledge through collaborations. He however warns that much as social interactions can be performed from several platforms such as face book, twitter, MySpace and others, not all these platforms can be effective in supporting learning. He warns the teacher trainers and trainees to be aware of this, some of these platforms may accommodate collaborative tools, but hard to track or monitor learner's academic activities. He argues that a platform which does not have the following features is not suitable for learning and teaching purposes; quick access to the materials, allows updating and editing of materials at anytime from anywhere, allows videos and audio, blogs which allow users to publish their work on the platform etc. And Abao, Dayagbil, & Boholano (2015) warn teachers that, much as social interactions may promote ones' ICT knowledge, but then ICT does not automatically improve teaching and learning, it is the role of teachers to do something to motivate learners. Even though, a particular ICT may have a lot of good features; it is the role of teachers to make meaningful use.

Teacher trainers as well as trainees need the technology knowledge to be able to make meaningful learning interactions. Angeli & Valanides (2009) informs us that, relevant ICT integration knowledge requires both lecturers and students to understand: (a) the technology tools themselves, combined with (b) the specific affordances of each tool, in that when such technology is used to teach content, it enables difficult concepts to be learned more readily, thus resulting into deep learning. Lawless and Pellegrino (2007, p. 580) also assert that, lecturers need technology knowledge if they are going to prepare their students to be technologically capable. The study revealed a number of technology knowledge areas for both learners and teacher that were because of social interaction process: c*ontent analysis*, *research knowledge*, *civic literacy*, *media literacy*, *distributed cognition*, *Collective intelligence* and n*egotiation.* In the same line, Vygotsky (1986) also found out that, in enabling the connection with other people around the world, the communicative potential of ICT provides learners with the opportunity to extend the 'zone of

proximal development: where the teacher trainees have empirically rich but disorganized spontaneous materials now link up with the systematicity and logic of adult reasoning from other parts of the world through online interactions to generate meaningful interpretation of content.

Cennamo, Ross and Ertmer (2010, p.10) indicated that, to achieve technology integration that targets student learning, lecturers need particular technology knowledge that enables them to: identify which particular technological tools are needed to support specific curricular goals; specify how the tools will be used to help students meet and demonstrate those goals; enable students to use appropriate technologies in all phases of the learning including exploration, analysis and production and also to select and use appropriate technologies to address needs, solve problems and resolve issues related to their own professional practice and growth. Researchers like, Vajargah, Jahani and Azadmanesh (2010), also found out that research technology knowledge can be used to support teaching and learning as well as collaboration among teachers and learners. These researchers further say that, teaching is an ever-changing profession and that the field of education is expanding each year as advancement is made in technology and brain-based research, therefore to keep pace with the changing world, teachers and teacher trainers must have current technology knowledge. So, the study was set out to establish how the teacher educators to gain technology knowledge can make use of social constructivist approach to enrich their knowledge of ICT integration, because the theory looks at social interactions as one avenue of gaining this kind of knowledge. The fact remains, when ICT is well integrated in teaching, it promotes deeper understanding, but the biggest concern is on how to promote teacher educators' and trainees' ICT knowledge.

Study findings clearly indicated that there is still a big gap regarding teacher educators' speed of grasping the relevant technology knowledge. This is in line with Orlando and Attard (2016) who reported that teachers' technology Knowledge on how to integrate technology in the classroom was found to be low whereas during the digital story telling activities**,** students exhibited

fair knowledge on how to interact with their counterparts using different ICTs and this could be attributed to the fact that today's learners are digital natives, they have been born when these technologies are on a high rise, so they find it much easier to learn by doing. Students are capable and motivated users of new technology; their technology knowledge is basically based on home resources and leisure time use. Students have knowledge to use new kinds of applications and new forms of technology and their ICT knowledge is wide, although not necessarily adequate for integration in learning; so, their study habits are still ineffective and even wrong when it comes to technology integration, but since they are used to these technological devices and applications, it is a bit easy to bring them on board. Some students especially those who have had the chance to interact with these technologies before have a special kind of ICT-related adaptive expertise which develops in a beneficial interaction between student-teacher and content.

Teacher-educators' and teacher trainees' technology skills

In this study teacher trainer and trainees gained several ICT skills through learning social interactions, some of the key technology skills gained included: *Information /data presentation, Communication skills, Collaborative skills, Problem solving skills, Critical thinking, Multitasking etc.* The results indicate that these skills cannot be attained in isolation of teaching, so the teacher educator as well as the teacher trainees properly exchanged information using ICT tools and application and by the end these social interactions, they were acquainted with a number of digital skills as presented in Chapter Four *Table 4.6*. The reason to why ICT skills need to be integrated within the study content is that they are complex, whereas learners can easily adopt these skills through interactions with one another over the given subject content.

In the same perspective, Voogt & Pelgrum (2005) indicated that, ICT skills are complex, and therefore must be taught in a context integrated into the curriculum and as part of complex skills such as information handling, collaboration and communication and were embedded in an authentic context. Essentially one of the famous approaches of ICT integration is embedding the

required ICT skills within the curriculum, but not handled in isolation of the study content. Social constructivism is an approach which emphasizes action of learners; it basically looks at learners as active workers on knowledge creation within their group interactions, and so if these interactions are managed with appropriate ICTs, it will in the end promote learners' digital skills in the due process.

Researchers like Even, Mishra and Koehler (2006) revealed that, the application of technology skills in teaching and learning is not context free; yet professional development centered on isolated technology skills has been prevalent in most institutions especially in developing countries. Technology skills learned in isolation may even have a negative impact on an instructor's ability to see the complex application of that technology in a pedagogical and contextual nature, so in teacher training, technology should be integrated within content otherwise it loses meaning. In this regard, Social constructivism presents an approach of promoting ICT in teaching and learning, which focuses on social processes which involve learner, teacher, and content in a continuous interactive learning process. These social processes are not naturally learnt but require some effort from both the teachers and learners. Technology skills require one's continuous ability to exploit the opportunities offered by the technology and use them critically and innovatively in teaching and learning. This is in line with what Norwegian Ministry of Modernization (2009, p.8) recommended that, the use of digital tools in teaching and learning is a skill the individual must acquire, maintain, and continually develop.

Many other researchers agree with the study findings, that gaining ICT skills is teamwork, team spirit, which means that these skills can effortlessly be acquired if the teacher trainers and trainees accepted to work in groups, and therefore this process results into effective collaboration between teacher and learner. Other researchers like; Redecker, Leendertse, Gijsbers, Punie, Kirschner, Stoyanov, & Hoogveld (2010) also entirely agree that, technology skills inspire teachers' pedagogical collaboration and functions as a catalyst of change since many educational settings in

which ICT is used become cross-disciplinary, teachers become team members instead of independent workers. One aspect the research observed was that social interactions can truly promote teachers' technology skills however, like mentioned earlier, team building is important because an interaction of only two lecturers on a given topic or project may not result in positive results since the larger the group the bigger the level of interaction.

On the other hand, the study results continued to indicate that, teachers who use technology frequently to support learning in their classrooms report greater benefits to student learning, engagement, and skills from technology. Researchers like Richard W., (2010) in the same line reveal that, learners who interactively use ICT in learning tend to be more competent even in other areas of life because of their various engagements with technologies. Study findings indicated that, when learners use ICT to interact, they gain skills such as *digital networking skills, data management skills, Internet skills, communication skills, self-direction skills* which is to do with *self investigation, creativity, collaborative skills, problem solving skills, information literacy skills* and *multitasking.* Such digital skills support learners in other areas of self management, take an example of communication skills, this cuts across disciplines, problem solving, it does not only apply to ICT tools, internet skills, to access information today, this has become almost a compulsory skill. These technology skills promote the learners' ability to understand other subjects and improve on their creativity to survive in the world of work.

Study findings strongly show that among the many benefits ICT supported social interaction is that it promotes *self-direction skills which have to do with self investigation or discovery learning*. This agrees with Bahufite (2017) who puts across some two important points here, motivation and discovery. He indicates that, when teachers and learners (teacher trainees) interact online, and commends that, ICT provides a rich environment, capable of helping learners gain new experiences and enhance collaboration and discovery. He farther reveals that if ICT is accurately used in education offers a virtual learning environment rich in stimuli and able to modify the nature

of education, minimizing the indispensability of the teacher's action hence maximizing the learners' involvement through discovery and exploration in full motivation.

Whereas the study findings revealed that social interactions have improved learners' communication skills, Tondeur, Forkosh, Prestridge, & Edirisinghe (2016) indicated that, when the teachers communicated and shared their teaching material; they felt confident and secure since their innovative approaches were accepted by students. These researchers considered teachers' communication and working together with students as a requirement for quality teacher training and the leading to confidence building. Communicating with the students' offers a great opportunity for teachers, to better design lessons tailored to students' needs and activities initiated at school. This interaction will foster more sharing between students' different backgrounds and more inclusion especially where there is a language barrier. Teacher training in this digital communication world is very useful since it allows learners to construct new knowledge, reflect on the process and receive feedback. Through reflection, teachers could critically examine their work, understand new conceptions of constructivist teaching and learning, and accept new roles of teaching from an instructive to a more constructive approach (Tondeur et al. 2016).

Problem solving is a technology skill which is not automatic to attain, but teacher trainees had better ability in adopting such skills. Social interaction increases teacher trainers' and learners' *data and information management skills, that is; participants'* potential to create, organize and store information in a digital form most especially information they had downloaded from the internet. However, such skills imply involving learners in several activities which require critical thinking, assign group project work, computer simulations, scenarios or cases and inquiry activities. Researchers like Al-Qallaf and Al-Mutairi 2016; Tondeur et al. (2016) also support these findings, they actually revealed that, since the learner has some digital skills already, problem solving skills will come as long as the learner is engaged in a task that demands frequent commands such as games and simulations. And this implies that, technology skills such as problem

solving change the teaching approaches in one way or another, since learning in this case is action-oriented, this compels the teacher to design learning activities that are engaging which in the end force the learners to be more active, more involved in the learning process and very participatory unlike in the traditional learning perspective where the teacher is the center of all the learning activities.

However, problem solving is a skill which learners will gain after acquiring almost all the other basic ICT skills. On the other hand, Al-qallaf and Al-mutairi (2016), argue that, problem solving skills also enhance teacher's teaching practices, because they call for developing project-based learning activities, assigning learners a task for their own investigation, which requires collaborative inquiry that leads to cooperative learning and in the end learners gain technology skills which support their learning interactions such, internet skills, connection skills, collective intelligence, orchestration, content analysis and also civic literacy.

Akoojee, Arends and Roodt (2008) classified technology skills as: a) lower level skills- under which occupations require considerable ICT know-how and, therefore, are not excluded from the intermediate level; b) intermediate-level skills- include those who rely either exclusively or reasonably extensively on computer technology for the successful accomplishment of their core function and c) higher level skills- occupations are characterized by the specialist nature of ICT work associated with software and hardware development. This study did not classify technology skills in the same way, hence the analyses and discussions have not had a lot of argument along these lines, and this makes it hard to measure the level of our participants along the same lens, since there was not any yardstick to measure them. But this does not imply that the study results disagree with the above authors, there was some evidence that participants' technology skills were also graded according to their interactive level as: lowly, moderately or highly efficient.

Cultural processes and Teacher-educators' technology knowledge and skills

Individual values such as attitude, individual's ICT background, subject discipline was assessed here and study findings indicated that, these particular values contribute to the uptake of ICTs in teaching. These results agreed with researchers like; Chai, Koh and Tsai (2010) in Shan (2013) who also revealed that, teacher' beliefs enhanced technology integration into their curricula and that ICT use would enhance student learning. Again Tezci (2011b) agrees that, teacher beliefs and perceptions regarding ICT usage and found out that, teachers who had positive attitude towards use of ICT in teaching were found to always apply it to facilitate learning. But on the other hand, Ward and Parr (2010) indicated that, unless teachers gain the confidence, their ability to facilitate student learning with technology in classrooms may yield no results. This implies that, much as a teacher may have positive thinking about ICT integration, if they do not work hard to gain confidence and competence, they may hardly benefit from its usability. Then, Graham (2011) also indicated that, implementing effective teaching with technology integration requires changes in teachers' beliefs, and he warns individual teachers and researchers who always emphasize the TPACK framework, appraising it for being the basis for effective teaching using ICT that, it fails to take into consideration the teachers' beliefs and values about teaching which are considered very important factors when teaching with ICT.

Study findings showed that, subject discipline or disciplinary background for the teacher educators plays a great role in promoting ICT integration. It was found that more practical subjects tend see a lot of value in using ICT tools, hence its application especially those that require illustrations and demonstrations such as simulations and animations and these have greatly improved teachers' technology skills and knowledge. Subjects like; Mathematics, physics for modeling purposes, Biology, and chemistry for illustrations, in all these disciplines which required more practices skills have forced teacher trainers to adopt ICTs to simplify the learning process, unlike teacher trainers handling subjects like; Geography, religious studies, History, Economics

extra, which are less practical in nature. However, researchers like Donnelly, McGarr & O'Reilly (2011) attribute this disparity to the degree on what teacher trainers do and think, but otherwise all disciplines would have the same demand for ICT integration, it is the teacher's willingness to adopt. These researchers disagree that it is about the disciplinary need, but rather it is the teacher's need and value to integrate ICTs in classroom teaching.

The researcher also took kin interest in aspects like; *curriculum design and development*, *ICT policies*, *leadership styles* and the study findings revealed that, these aspects were so fundamentally important in promoting ICT integration which meant that, instead of always talking about ICT integration workshop, let us look at these aspects and work towards improving them and the result will automatically improve teacher educators' and trainers' use of ICT in teaching and learning. Tezci (2011) findings were also found to be in line with these results as they also revealed that, the school culture is a key in contributing to the development of ICT knowledge and skills. According to the author, by internal factors such as the school culture emphasis was onto aspects like, the curriculum, school policies and leadership. Singh (2015) found out that transformational leaders have a significant influence on achievement of goals by fostering trust and building relationship with subordinates. So, promoting technology knowledge and skills in teaching requires the College, School and Departmental heads to build good relationship with the people they are leading, they must promote teamwork amongst staff to build social interactions.

Leadership styles commonly practiced by university administrators include authoritative, distributed, democratic, transactional and transformational styles and these may have effect on the adoption of digital skills and knowledge for teaching. Since the study aimed at ICT integration which is still bothering many teacher educators in developing countries, results indicated that transformation leadership style was more suitable for the cause however, it looks like Makerere University uses authoritative style most. The study findings are in line with Odumeru & Ogbonna (2013) who also found out that, Transformational leadership style positively correlated with

teachers' positive perceptions, motivation, trust, conviction, collaboration, innovation, self-esteem, and performance which reflect a willingness to learn and serve. Transformative leaders will always practice the qualities of Idealized Influence, Intellectual Stimulation, Inspirational Motivation and Individual Consideration and they are usually so successful in engaging their subordinates in making the extra efforts to learn new approaches of doing things.

Bateh and Heyliger (2014) found out that faculty members who identified transformational leadership as dominant had increased performance. Individual teacher trainer's performance is in line with the ability to identify new ways of doing something; such new approaches include the adoption and application of digital technologies in teaching. Individual consideration about transformational leadership is very supportive and indicates that there are influences in form of; intellectual stimulation and inspirational motivation attributed to this leadership style. These indicate that, organizations where leaders are perceived more transformational tend to influence followers more positively to improve performance.

However, Shamaki's (2015) proposed democratic leadership as it promotes teachers' job productivity than any other type of leadership style. I think Shamaki was right in that aspect, because the interest was about job performance in general, but our study was in particular to ICT integration, hence the best style that promotes innovation is transformative. Wu and Shiu (2009) on the other hand have also got another view that, sometimes authoritarian leadership is good because some workers need to be forced to work or else, they will never adopt new methods of work. To some extent their recommendation has some weight, like McGregor' Theory X in his book, "The Human side of Enterprise," who indicates that if your workers are less likely to work because they need some motivation of a certain kind which may not be possible, then simply force them to work, in other words, use authoritarian style, here there is no negotiation, but rather command. It implies, indeed, in some situations, people need to be forced before they could improve productivity. Other researchers like, Nampa (2007) in Aunga and Masare (2017) cautioned that leaders who want the

best results should not rely on a single leadership style. They explained that different people require different styles of leadership. According to them the leadership style for new employees should be different from that of experienced employees because the former requires more supervision than the latter. Similarly, the leadership style that suits employees who are highly motivated cannot be the same as that of their non-motivated counterparts. But I think, the issue of leadership style and ICT integration depends on the needs of the institution and the characteristics of the employees, so I would think a variety of styles can be applied and still attain positive results, much as I would also go in for transformative as a constructivist thinker.

Curriculum design and development is another important aspect regarding technology knowledge and skills. The way the curriculum is designed will promote ICT integration and, in the end, it will help teachers develop the ICT skills and knowledge. One teacher trainer was concerned, *"many colleagues up to today have failed to acquire specific ICT skills and knowledge simply because these were not embedded within the curriculum*". Study results show that, the current curriculum does not specify where and when to use these ICTs, and this limits teacher educators' effort to generate skills and knowledge. Along the same line, Tosun & Barişusing (2011:223) indicated that universities which want to reposition themselves in the market, they must have a strategic plan which clearly indicates how technology integration should be done, and this arrangement must be in line with the teaching curriculum. It is evident that certain digital competence skills and knowledge will be necessary for students to develop to be able to work and contribute to a globalized information society of the 21st century. But these requirements are not being reflected in the current University curriculum and hence it becomes very hard to implement technology innovations and integration. It should be noted that, the purpose of ICT in the educational curriculum is to enhance the learning process through the interaction of students and teachers and the course contents of the curriculum (Obunadike, 2009). Along the same line, Aguti (2016) also agrees that ICT knowledge and skills can best be implemented through curriculum

design and development, she explains that much as a lot has been done to promote teacher educators' digital skills and knowledge, there is still need for continuous transformation of the curriculum to include ICTs for teaching and learning. This implies that, if teacher trainers' and trainee's ICT skills and knowledge are to be promoted, then this recommendation must be put into action, let the curriculum reviews include ICT integration as a key aspect if we are to meet the new demands of the current generation that is normally referred to as digital natives. Therefore, curriculum development, if properly accredited, is one of the most effectual protections against poor educational and development outcomes; although, it may not be cure-all, because of other factors.

Regarding ICT policy guidelines, study findings indicate that, there is no doubt about policies as these are very fundamental in promoting technology knowledge and skills. Makerere University ICT policy (2016 – 2020, p.6) emphasizes the promotion of ICT in teaching and learning. The same policy (p.9) indicates that, The College Principals/ Heads of Department oversee this process, they must monitor ICT integration in the teaching, a lot of attention was put on to infrastructure and accessibility. But unfortunately, the policy does not clearly indicate how the entire innovation is to be implemented, it does not provide the framework for this cause, because implementation of ICT integration strategies is supposed to be followed by the monitoring, evaluation and feedback processes for the purpose of quality assurance. National ICT policies are marked as being so fundamental in promoting ICT usage in teaching in institutions as indicated by Jones (2003) and Kozma (2003a). These studies suggest that, strategic policies can provide a rationale, a set of goals, and a vision for how education systems might be with the introduction of ICT, and how students, teachers, parents, and the general population might benefit from its use in schools especially transforming education at large and the teaching approaches. These strategic policies must give clear guides on how for example the implementation process can be affected to advance a nation's overall educational goals. It is again

believed that much as certain innovations can happen minus a policy, implementation requires some guidelines and rules of procedure.

Therefore, we can arguably say that, both National and University policies have several gaps, there is no monitoring of such proposed processes simply because the particular immediate supervisors are not well facilitated and lack specific evaluation procedures. Aguti (2016) reminds us of the need to have appropriate policies and policy environments that support transformation, creativity, and innovation. In the same line, researchers like; Foley & Ojeda (2008) in Waycott, Bennett, Gregor, Dalgarno, & Gray (2010) also indicated that, the limited use of educational technologies in university teaching is due to limitations in national and institutional policies and management practices about ICT integration. In agreement with the study findings, UNESCO Report (2012) indicates that, despite the growing demand for data on ICT in education, the best-known international sources of education statistics lack basic information about ICT policy in education. This implies that, one of the many reasons especially in teacher training institutions why technology integration and digital competence skills and knowledge are still limited amongst the teacher trainers and trainees in either poor ICT policies or inadequate implementation procedures. Like some old research by enough Cohen and Hill (2001), who warned that, ICT policies can fail successful application especially when: they are viewed as mere symbolic gestures; teacher-trainers actively resist policy-based change that they see as imposed from the outside without their input or participation; they do not have clear connections to instructional practice etc. Also, Ottestad (2013) emphasizes that, educational policies dictate teachers' use of specific ICT tools in teaching and learning. So, this ICT policy aspect needs to be taken seriously if teacher trainers and trainees are to make meaningful benefit of ICT integration in teaching and learning process.

Study Conclusions

1. The first objective aimed at establishing how the social processes can nurture teacher educators' and trainees' technology knowledge in teaching at Makerere University. Data

obtained from the study identified that social processes promote a number of technology knowledge aspects such as research knowledge, civic literacy, media Literacy, distributed cognition, collective intelligence, judgment, negotiation, extra, it was however concluded that; team work is a basic technique for developing teacher educators' and trainees' technology knowledge.

2. The second objective aimed at establishing how the social processes can nurture teacher educators' and trainees' technology skills in teaching at Makerere University, and study results indicated that several technology skills can be attained from social interactions such as; data management, Internet, communication, self-direction, appropriation, creativity, collaborative, problem solving, multitasking etc, however it was concluded that, technology skills require continuous active practice and they cannot be attained in isolation of technology knowledge.
3. The third objective aimed at establishing how the cultural processes influence teacher-educators' technology knowledge and skills in teaching at Makerere University, several aspects were found to be pertinent, but it was concluded that, both institutional and individual cultural values are fundamental in influencing teacher educators' technology knowledge and skills.

Study Recommendations

1. Basing on the conclusion for the first objective; teacher trainers should engage in team or co-teaching. The study results have clearly indicated that, technology knowledge is attainable when a more knowledgeable user interacts with low level users, so let the spirit of teamwork be practiced during our teaching so that, where a particular topic requires application of ICT, the team or group of lecturers handling the course unit must work together to do the teaching.
2. Basing on the second objective; computer skills are action-oriented; this implies that teaching and learning should be action-based. Teacher trainers for that matter should emphasize active teaching and learning, they must therefore ensure that their course units

are managed with some action-oriented activities for their learners. Teacher educator must design project-based activities which require use of ICTs to promote technology skills.

3. As per the third objective, it is observed that, the existing University (institutional) ICT policies are weak when it comes to implementation, therefore School of Education Dean and Heads of Department should develop an evaluative instrument to regularly assess the extent to which their academic staff are using the available technologies such as MUELE to facilitate teaching and learning in the different Departments per course unit.
4. Again, basing on findings and conclusion for the third objective, University management (office of the Deputy Vice Chancellor in charge of Finance) should provide academic staff with adequate ICT facilities both in offices and lecture rooms and designated computer rooms for purposes of planning and preparing for teaching, because it was realized that the biggest number computers used by staff are personal and this implies that these facilities are for their private work and projects. So, this calls for an annual budgetary allocation to the Schools to manage their ICT infrastructure.

Theoretical contribution

This study adopted social constructivist theory to understand how teacher educators and trainees can gain technology integration knowledge and skills without formal trainings. Social constructivism as earlier said in chapter one is a theory which tries to address the process through which learning occurs and it elucidates that, knowledge is the result of social interaction and so it is a shared, rather than an individual, experience. Social constructivism, a social learning theory developed by Russian psychologist Lev Vygotsky, posits that individuals are active participants in the creation of their own knowledge (Schreiber & Valle, 2013). Vygotsky believed that learning takes place primarily in social and cultural settings, rather than solely within the individual (Schreiber & Valle, 2013). The social constructivism theory focuses heavily upon small group learning.

For instance, students learn primarily through interactions with their peers, teachers, and parents, whereas teachers stimulate and facilitate conversation through harnessing the natural flow of conversation in the classroom. Social constructivism suggests that successful teaching and learning is heavily dependent on interpersonal interaction and discussion, with the primary focus on the students' understanding of the discussion. When people interact with each other or with certain aspects of their own environment, there is a likelihood of gaining some sort of understanding, thus a process of knowledge creation is through dialogue and negotiation. In this way, constructivist learners are viewed as active participants in knowledge creation, so learners are not passive recipients of knowledge but fully involved in the entire process of building or construction of knowledge. In this study however, the theory did not look at learners as merely students in a classroom setting managed by a teacher, but rather learners are any learning agent where age is not a key characteristic, implying that even the teacher trainers are learners at some point, since learning is an interactive process. A learning agent could be a teacher who may also be engaged in an interaction to gain new understanding of phenomenon, teacher educators in their quest for new technology skills and knowledge become learners too. The whole process leads to a model of conscious-based learning, which implies that, to gain any new technology skills and knowledge is a product of one's consciousness.

Vygotsky's Zone of Proximal Development

One of the things that interested Vygotsky most of all was the way in which learners make progress. Because of Vygotsky's view that development and learning take place simultaneously, it is acknowledged that sometimes it can be difficult to determine what a child knows, and what the child is still in the process of learning. It is only when the teacher probes what the learning is thinking that it becomes clear how well the learner has grasped the material in hand. Vygotsky stated that "what a child can do with assistance today, she will be able to do by herself tomorrow" (Vygotsky, 1978, p. 87). This period between learning to do something with help from a teacher

and being able to do it without any help is the Zone of Proximal Development. The main strength of this theory is that it is very intuitive and easy to grasp, and it can be applied universally to any educational context. Its basic principle of learning from a more skilled individual underpins many formal and informal types of education. The teacher is there to demonstrate and to guide the learner through new tasks, offering advice and encouragement, and setting sub-tasks that the learner must complete to achieve the larger goal that the teacher has judged appropriate for the age and level of development of the learner.

Application of ZPD to ICT integration in teaching and learning?

One major impact of the broad popularity of Vygotsky's ideas has been an acceptance of the need to monitor children's progress on a very regular basis, in order to determine exactly which stage, they have reached, and then determine what kind of input and interaction they need in class in order to progress to the next stage. This context is what the study emphasized; this study looked at ZPD as a way of gaining more knowledge and skills from a more knowledgeable other. During the interactive learning process through technology teachers and learners interact with content in different forms and at different levels. Today’s learners especially those we call the digital natives have more potential and power to play around with these technologies to manage the teaching and learning process, and in some circumstances even much more familiar that the teacher educator. So, ZPD in such a situation does not necessarily consider age, but rather who learns from whom, in other words, the gap between what the learners knows and what he/she does not know is bridged by interaction or collaboration between teacher and student. Which means; the teacher trainee can gain technology skills and knowledge from the teacher, but at the same time the teacher trainer can also learn from the student. Vygotsky's theory can be linked to practice through a proper understanding of the collaborative and reciprocal nature of learning. The traditional view of learning as the transmission of knowledge from one person to another is not appropriate, and instead teachers

should ensure that the classroom is full of interactions that are both meaningful and purposeful for each learner. Within the same classroom, children might be at different stages and so there should be a range of opportunities on offer for coaching and mentoring so that every child reaches the milestones that are set in the school curriculum.

Major study limitations

Generalization: In quantitative research methods we normally generalize basing on our huge data, but this being a qualitative and interpretive action research, it was quite complex to make generalization of the findings, however any researcher who may want to do a similar study in future but in another teacher education institution will be free to have a strong contextual base for drawing general conclusions if comes out with similar study findings.

Limited contextual research studies on the topic: Context in an essential part of the literacy text, which helps to engage the audience and usually without this, readers may not see the true picture of the literacy work. Contextual literature helps readers to understand the cultural, social, philosophical, and may be the political movements prevalent in the society at a time of writing. However even if the contextual literature is limited, if what is available has authenticity which is not doubtable, then its application will offer similar results much as better if sources are numerous. So, the researcher based on the little contextual literature that was available to build a strong a firm base for the readers to clearly understand the point addressed, and this has also now widened the broadness of the available contextual literature for future researchers.

Sample size limitations: With my Economics background, as a researcher but as well as a participant of data collection, I thought I would engage better with participants who share common knowledge of the Subject, but to my surprise, very few students offer Economics in the School of Education (year three), so I worked with a very small sample size, however, since the study was qualitative in nature the question of size did not cause a major impact on the study findings and

furthermore, it was good that the few participants that participated had a of interest in the study and they generally gained fundamental technology skills and knowledge during the process.

Resource limitations: the state of computers in the School of Education is unexplainable, these computers have served for more than ten years now and one would say, they have become obsolete and so we found a big problem of working from the common facility, but since most of the work was through online and good enough all participants had smart phones, these saved the situation, but we also had a chance of accessing computer facilities from other places outside School of Education.

Areas for further research

1. The study did not explore in detail of subject discipline in line with digital competence much as results indicated that different disciplines tend to adopt different digital technology knowledge and skills differently. There is need to evaluate in detail Social constructivism approach per academic discipline in teacher training curriculum so that teacher educators as well as trainees may easily integrate technology accordingly.
2. The study greatly explored social constructivism as a branch of constructivism and digital competence because social problems are socially constructed or subjectively interpreted, but there is need to investigate how Radical Constructivism promotes technology adoption in teaching and learning. This theory suggests that human knowledge is a construction built through adaptation of cognition. Learning of anything will only take place when learners can think about certain principles and concepts which are presented to them.

3. There is a great need also to come up with psychological approaches which can be used to address teacher educators' attitude to ICT integration. Because study findings revealed that, one of the key aspects for technology knowledge and skills adoption is attitude.

4. Technology integration in teaching involves both the teacher trainers and trainees, this study addressed teacher trainers' values for technology knowledge and skills, so there is need to establish teacher trainees' values and technology knowledge and skills.

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APPENDIX A

FOCUS GROUP DISCUSSION GUIDE FOR TEACHER TRAINER/TRAINEES

Dear participant,

I am pursuing a PhD in Educational Technology, at Makerere University under the topic, "***Utilizing a Social Constructivist approach to cultivate Teacher-educators' digital competence in teaching at Makerere University".*** This instrument intends to collect information on the above topic and you have been identified as one of the respondents for this study. All responses given shall be "STRICTLY CONFIDENTIAL". So please, answer the questions to the best of your knowledge, accurately and without any worries. The information you give is very important for both planning and scientific research in education.

David Kakeeto

(The Researcher)

Section A: Social processes and teacher trainer/ trainees' technology knowledge

1. How do you think the social interactions can change your teaching/learning approaches from traditional to a learner-centered approach?.....
2. How do you think Google classroom technology can promote your ability to understand the study/teaching content in a much better way? .....
3. How do you think learner/lecturer engagement can be cultivated particularly for online course units?.....
4. How can you use ICT to carry out discussions with your lecturers/students? .....

5. How do you think information technologies can be used to support you as a lecturer/learner in knowledge

   application?.....

   …….

   .

6. How good is it to learn how to use ICTs from a friend other than a formal training workshop?.....

   ……

   …

7. What sort of ICT knowledge have you acquired from colleagues as a results of collaborative learning/teaching

   activities?…….

Section B: Social processes and teacher- trainers/trainees' technology skills

8. Do you think social interactions amongst students who are knowledgeable and those who are not conversant with ICT in teaching can promote ICT computer

   skills?.....

   (if yes) how ……

9. How should The University support students to acquire the necessary ICT skills?…….....

10. How do you think such learning interactions can be enhanced amongst teachers and students?.....

    ……

    ……

11. What social media platforms do you think are more suitable to promote I.T skills for teaching and learning?.....
12. What sort of ICT skills have you gained as a result of these social interactions?.....

Thank you

APPENDIX B

AN INTERVIEW GUIDE FOR THE TEACHER EDUCATORS

Introduction.

Dear Sir, Madam, Dr, Prof,

I am pursuing a PhD in Educational, at Makerere University under the topic, "***Utilizing a Social Constructivist approach to cultivate Teacher-educators' digital competence in teaching at Makerere University".*** This instrument intends to collect data on a certain study objective: establishing how the cultural processes improve teacher-educators' technology knowledge and skills in teaching at Makerere University. You have been identified as one of the respondents for this study. All responses given shall be "***STRICTLY CONFIDENTIAL".*** So please, answer the questions to the best of your knowledge, accurately and without any worries. The information you give is very important for both planning and scientific research in education.

Yours faithfully,

David Kakeeto

(The Researcher)

Section A: Background Information

1. **Department:**

a) Humanities and Language Education

b) Science, Technical and Vocational Education

c) Foundation and Curriculum Studies

2. **Subject specialty**……

3. **Level of education:**

1. Masters

2. PhD

3. Post Doctorate

4. **Teaching experience in terms of years taught at the University:**

a) Less than 5 years

b) Between 5 and 10 years

c) Between 10 and 15 years

d) Between 15 and 20 years

e) More than 20 years

5. **Rank within the University structure:**

a) Assistant Lecturer

b) Lecturer

c) Senior Lecturer

d) Associate Professor

e) Professor

Section B: Cultural Processes-Individual Values

Use the above scale to indicate your opinion on the items stated in the table below by simply putting a tick in the box applicable to your view.

	Item

6.	How do you perceive the general attitude of teacher educators here in The School of Education towards the development of ICT skills and knowledge for integration?.....
7.	As a teacher educator, do you think self efficacy is a key aspect in acquiring ICT skills and knowledge for teaching?.....
8.	What do you think about teacher educators' ICT background in relation to improving ICT integration in teaching?.....
9.	As an experienced teacher educator, what is your take on disciplinary background (academic disciplines) in line with teacher trainers' potential to acquire digital skills and knowledge for integration?.....
10.	Do you think ICTs are being used differently in the different academic disciplines/subjects here in School of Education?.....
11.	If yes to the above question, where do you see the gap if you compared ICT integration between science and humanities disciplines within School of Education, Makerere University?.....
12.	Would you for example say that teacher educators in the humanities have been very practical in using ICTs in teaching as compared to their counterparts from the Science Department, what shows?.....
13.	What is your view about disciplinary ICT requirements, do you think discipline priorities and needs may dictate the application of ICT in teaching?
	Section C: Cultural Processes-Institutional Values
14.	What do you say about the nature and design of our curriculum, does it support teacher trainers' acquisition of technology knowledge and skills?.....
15.	Let us look at the current ICT policies in the University, what do you say about them, do you really think they may greatly promote teacher trainers' acquisition of technology knowledge and skills? ***Any additional comment on this?.....***
16	How do you think University ICT policies can be improved if we are to achieve full utilization of ICTs in teacher training? …….
17.	The University at large has been emphasizing ICT infrastructure, how do you perceive the available ICT structures in the School of Education, are they good enough to promote teacher trainers' acquisition of technology knowledge and skills, if not what is your advice? …….

18.	Do you believe that leadership styles are a key factor in promoting ICT integration knowledge and skills?.....

19. Which one of the following leadership styles below do you think is more suitable in promoting innovations such as technology integration in teaching and learning?

Leadership style	**Tick ✔**
1. Authoritative leadership	
2. Distributed leadership	
3. Transactional leadership	
4. Transformational leadership	

20. Which one of the above leadership styles do you think is being practiced at Makerere University and why do you think so?.....

Thank you so much.

APPENDIX C

OBSERVATION CHECKLIST

The researcher had this checklist to indicate whether a particular participant gained such indicators of technology skills:

Competence area:	**Indicator**	***Yes* (x)**	***No* (x)**
1. Information management	• Creating Files and folders		
	• Store, locate, organize		
	• Downloading journals/textbooks		
	• Transferring information from internet		
	• Retrieving files		
2. communicative	• sending/receiving messages online		
	• telephoning over the internet/video calls (via webcam) over the internet		
	• participating in social networks		
	• posting messages to chat sites		
3. Content creation	• uploading self-created content on platforms		
	• Creating blogs		
	• using copy and paste tools to duplicate or move information within a document		
	• creating electronic presentations with presentation software (e.g. slides), including e.g. images, sound, video		
4. Problem solving	• connecting and installing new devices		
	• installing a new or replacing programs		
	• connecting to internet using Wi-Fi (wireless fidelity)		

APPENDIX D

Consent Form for Participation in a Research

Title: Utilizing a Social Constructivism approach to cultivate Teacher-educators' and Trainees' digital competence in teaching at Makerere University

Description of the research and your participation

You are invited to participate in a research study conducted by David Kakeeto (Principal Investigator). The study is aimed at establishing how the social constructivist approach improves teacher-educators' digital competence levels in teaching at Makerere University.

Risks and discomforts

There are no known risks associated with this research or discomforts associated with this research.

Potential benefits

The major benefits of the study include knowledge generation on ICT integration at Universities and particularly for teachers.

Protection of confidentiality

We will do everything we can to protect your privacy, your identity will not be revealed in any publication resulting from this study.

Voluntary participation

Your participation in this research study is voluntary. You may choose not to participate, and you may withdraw your consent to participate at any time. You will not be penalized in any way should you decide not to participate or to withdraw from this study.

Contact information

If you have any questions or concerns about this study or if any problems arise, please contact (Principal Investigator: David Kakeeto) through phone: **0702-129861** or email: dkakeeto@gmail.com

Consent

I have read this consent form and have been given the opportunity to ask questions. I give my consent to participate in this study.

Participant's signature_____ **Date:** _____