THE USE OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) AND EFFECTIVE TEACHING AND LEARNING: A COMPARATIVE STUDY OF KYAMBOGO AND MAKERERE UNIVERSITIES

RASHIDA NANYANZI

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A RESEARCH DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTERS OF EDUCATION IN EDUCATIONAL FOUNDATIONS OF KYAMBOGO UNIVERSITY

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DECLARATION

I, Rashida Nanyanzi, declare that this dissertation entitled: **"The Use of Information Communication Technology (ICT) and Effective Teaching and Learning: A Comparative Study of Kyambogo and Makerere Universities"** is my original work and has not been submitted for any award in any University or institution of higher learning.

Signature…………………………………… Date…………………………………….

Rashida Nanyanzi

APPROVAL

This is to certify that this dissertation entitled: **"The Use of Information Communication Technology (ICT) Effective Teaching and Learning: A Comparative Study of Kyambogo and Makerere Universities"** by Rashida Nanyanzi, was carried out under our supervision and is ready for submission.

Signature…………………………………… Date…………………………………….

Dr. Julian Bbuye

Supervisor

Signature…………………………………… Date…………………………………….

Dr. Madinah Nabukeera

Supervisor

DEDICATION

This dissertation is dedicated to my lovely daddy Mr. Nyenje Muhammad and my Mummy Mrs. Nakalembe Florence, thank you for your endless love, sacrifices and relentless belief in my abilities. This achievement is a testament to your unwavering support, and I am forever grateful.

I dedicate it to my siblings Faithan, Naphy,Latifah and Muhammad and all my friends you have been my closest allies and biggest cheerleaders, thank you for always being there. Lastly to myself, for the determination, perseverance, and commitment to learning that have propelled me to reach this milestone. This dedication serves as a reminder of the strength and resilience that reside within me.

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ABSTRACT

The study set out to find out in a comparative manner whether use of ICT led to effective teaching and learning in Kyambogo and Makerere Universities. The objectives of the study were to determine how ICT literacy is related to effective teaching and learning, to find out the effects of ICT connectivity on teaching and learning and to establish the relevancy of ICT infrastructure in teaching and learning at Kyambogo and Makerere universities. The study used a descriptive cross-sectional research design that employed both quantitative and qualitative approaches. A sample of 399 respondents including students, lecturers, deans, and heads of departments participated. Structured questionnaires and interviews were used to collect data.Data were analysed using quantitative and qualitative methods. Quantitative data were analysed using descriptive statistics specifically frequencies, percentages, means, correlation, basic linear regression and t-test analyses while qualitative data was analysed using thematic analysis. Findings indicated that the level of ICT literacy had a weak positive and significant relationship with teaching and learning at both Kyambogo University and Makerere University. The study also found out that ICT connectivity had a strong positive and significant effect on teaching and learning at both Kyambogo University and Makerere University. The study further revealed that ICT infrastructure had a strong positive and significant effect on teaching and learning at Kyambogo University but a weak positive and significant effect on teaching and learning at Makerere University. It was concluded that ICT enabling factors which include ICT literacy, connectivity, and infrastructure play a significant and fundamental role in improving teaching and learning at Kyambogo and Makerere universities. It was recommended that more training should be provided to all students and lecturers on how to use and apply the different ICT tools in the teaching and learning process at the universities. More effort should be put in providing accessibility to internet in all areas within the universities and the infrastructure being average in both universities, the universities should ensure that the computers equipped in the different computer laboratories are fully functional and fully installed with the latest and necessary software that are required by different students.

CHAPTER ONE

INTRODUCTION

1.0   Introduction

The global urge for transformation, modernization, reforming and instilling of innovations in the education sector (Garth & Shaffer,2022) coupled with the changing nature of students and advancements in technology have pushed education to continuously take a shift and adapt the current and modern systems available for instruction at the time (Collins & Haverson,2018). The focus of this study was to examine the effect of Information Communication Technology (ICT) use and teaching and learning.

1.1   Background of the Study

1.1.1   Historical Background. Higher education is so important to a country's economic future that strategies for sustainable development should be put into action (Pedro et al., 2020). ICT must be incorporated into syllabi in order for schools and other educational institutions to adequately educate students for the "information society" (Ghavifekr & Rusdy, 2021). In Uganda, ICT is still being utilized for a number of business and other objectives, one of which is to function as a controlling enrichment device for certifying that the republic's visualization of 2025 hence adequately implemented in all sections of the economy as (Farrell, 2007). Among Uganda's goals are capital production, reducing poverty, preventing sickness plus improving health, and achieving those goals is thought to need literacy Kipkurgat (2006) hence it's against this backdrop that ICT was introduced. The topic of ICT Inclusion in instructional processes, majorly in the classroom, is crucial because its efficiency measures pedagogical qualities that result in superior learning by use of ICT rudiments and mechanisms (Jamieson-Proctor et al., 2013).

Many educational institutions worldwide have made significant venturing in the development of ICT infrastructure (Ertmer et al., 2012). On an international market, countries in the western world have e-learning programs offered via ICT and use electronic learning systems, video streaming, social media, and immersion in Second Life, among other topics (Basheka et al., 2016). In Western countries like Costa Rica, India, Chile, Jordan, Macedonia, Malaysia, Russia, and Singapore are among countries that use ICT - based instruction Trucano (2010), while in Africa countries like Tanzania, Congo, Guinea, Namibia, Lesotho, Madagascar, and Cameroon are among nations that have integrated the utilization of ICT into their academic establishments according to Wallet (2016) however, the majority of them lack a defined vision and well-thought-out strategy within an appropriate framework in regard to ICT.

Ever since the 1980s, Uganda has exploited ICT in education maybe as a result of the idea that it can provide unheard-of potential to raise standards, accessibility, and inclusion in training and education (Schech et al., 2017). At Makerere University, teaching and learning using ICT can be traced back to 1991, making the institution a mixed-mode university Muyinda (2012) whereas in Kyambogo University use of ICT is traced from 2007 and was started with the help of the African Virtual University (AVU) under the African Development Bank (ADB). To date there are ICT policies in almost all universities in the country and to guarantee that all students have equity in access regardless of academic standing since Uganda adopted its inaugural National ICT strategy in 2003 (Bernadette & Max, 2012). The policy's prime aim was to integrate ICT into educational courses and other educational programs and hence ICT use is encouraged across the board in Uganda's educational institutions (Habibu, 2012). The Ministry of Education and Sports has also produced a variety of policies, such as the ICT policy for elementary and post-primary schools, which intends to give ICT training to teachers. Information

and Communication Technology use is encouraged in all educational institutions in Uganda Habibu (2012) as policies are initiated and integrated on an institutional basis in tertiary education with the government and other partners.

1.1.2 Theoretical Background. Rogers' (1962) theory of diffusion of innovations (DOI), a communication theorist guided the research. DOI is a theory proposed by Alqahtani and Wamba (2012) to explain the working mechanism of how quickly fresh concepts and inventions are transmitted or diffused between cultures .The DOI theory emphasizes the importance of tailoring interventions to the perceived requirements, convictions, and beliefs of important stakeholders (Dingfelder & Mandell, 2011).Consciousness, persuasion, choice, implementation, and confirmation are the first five phases of the DOI (Sang & Tsai, 2009). Rogers referred ICT to a Precautionary invention which is a brand-new notion that a person adopts right away to reduce the chance of an adverse event, and determining how effective these innovations will be challenging because they are often applied slowly. To this effect, it delivers favorable results fast hence the incorporation of ICT into classroom instruction is regarded an incremental innovation in the current study, which employed the perceived qualities hypothesis.

Relative benefit, compatibility, complexity, observability, and trialibility massively aid diffusion are the components of the DOI theory. Relative advantage is "the extent to which an invention is judged as being superior to the notion it replaces" (Rogers (2003). The relative advantage parts of innovation are the cost and social status motivator aspects. For instance, whereas designers, early supporters, and the initial majority are motivated to adopt innovations, those who follow later and others aren't as driven by status. As a result, if teachers sense the usefulness of ICT in their lesson, they will employ it, according to the study by (Sahin, 2006). Meanwhile, efficient financial motives, either direct or indirect, may be used to encourage

individuals in a welfare structure to absorb an invention, so accelerating the process of implementation and boosting relative advantage. Wang and Lin (2021) define compatibility as the degree to which a new invention is thought to be in line with the preexisting beliefs, past encounters, and requirements of potential users. Individual needs and ICT compatibility could pose a detrimental effect on an individual's ICT use (Sahin, 2006).Complexity, according to Singh and Mishra (2008) is "the quantity to which a recent concept is evaluated as being hard to comprehend and apply". Inordinate difficulty in an innovation is a key factor in the employment since complexity has a strong connotation with adoption. If ICT adoption and use provides many problems for teachers and students, for example, the process may become more complicated, and vice versa.

Trialability, according to Manan and Noordin (2014), is the capacity to test a notion on an intimate level. The more times an invention is tried, the faster it is embraced. The concept "observability" was defined as "the level to which the implications of an accomplishment are noticeable to others. Peer observation or role modeling is a profound factor in accepting and spreading of ICT (Yang et al., 2016).According to Rogers's discoveries having a higher significant benefit, suitability, easiness, tangibility, and testability will be adopted faster than those without. Regardless of whether a new idea has obvious advantages, it can be challenging to get approval. Conclusively, based on Roger's recognized features and innovations characteristics, the study examined level of ICT literacy, ICT connectivity, and ICT infrastructures as possible components that affect teaching and learning considering relative benefit, compatibility, complexity, observability, and trialibility as influencers of instructional planning, classroom environment and assessment determined by ICT policy.

1.1.3 Conceptual Background. The independent variable was Information Communication Technology (ICT) defined as a fusion of any connectivity gadget, such as radio, television, mobile phones, desktops and network hardware and software, satellites, and the application areas that are attributed with them, such as video streaming and e-learning (Pratt, 2020). In this study ICT was conceptualized as literacy where users are Literate, Moderately knowledgeable and ICT illiterate. Connectivity as ICT being useful when it is available, reliable and affordable and Infrastructure in form of hardware, software and the number of computers.

The dependent variable was teaching and learning. Teaching according to Munna and Kalam (2021) refers to the transformation process of knowledge from teachers to learners. The concept of teaching, according to Jaggars (2014) consists of three steps: Systematic review, diagnosis, and authoring of objectives are a part of the teaching cycle. As a result of Jaggars' steps, teaching was defined in this study as knowledge transfer, resulting from the assessment, effective use of study materials, and effective feedback/communication. Munna and Kalam (2021) defined learning as a permanent change. In this study learning was conceptualized as selection of open electronic resources, formulation and response to questions.

In this study, teaching and learning covered delivery (monitoring, selection of effective delivery methods like Google meet, LMS and others), assessment (formulation of well-structured questions, collaborative, group assessment, projects and open book exams) and effective use of online education resources (selective research, appropriate selection and others) and how effective it has been cultivated in the two universities to realize teaching and learning ends.

The intervening variable was policy, Gallagher (1992) defined policy as a formalized act with a shared intention that is approved or recognized by a formal organization or entity in order to offer a standardized process for judging performance.

1.1.4 Contextual Background. Uganda's National Council for Higher Education (NCHE), according to Kamble et al. (2021), issued instructions to universities on the implementation of electronic learning to reduce the likelihood of COVID-19 transmission Reuge et al. (2021), therefore uptake by Kyambogo and Makerere universities (Khongsai et al. 2021). Kyambogo University confirmed readiness for electronic learning as per the directives Faraji (2020) with the most appreciated relative to their relevant infrastructure Kyambogo electronic learning management system (KELMS) (Nangonzi, 2016). Similarly, according to a report submitted by the task force on institutions readiness for ODeL compliance Makerere university had complied to developing a virtual platform dubbed Makerere university electronic learning environment(MUELE)(Wamai, 2020). However, the mode was not welcomed by most students in preference of physical classes as in 2021 Kyambogo University students protested against the implementation of online teaching methods and according to the students, a significant number of lecturers failed to provide them with essential reading materials. Some lecturers were found to be relying on handwritten notes, neglecting to cover the complete course content, and failing to respond to student inquiries (Faraji, 2022). Similarly, at Makerere University due to expensive internet prices and the difficulties in securing digital links, access was limited for students to the MUELE platform and were unable to complete their schoolwork as a result plus certain lecturers' incompetence to teach online and the requirement for students to take tests even though the topics had not been fully covered (Busein, 2021) .A report by NCHE (2020) stated that teaching in universities had remained too traditional as lecturers were identified to be using yellow notes, failing to complete their course content and failing to respond to students' inquiries while on the learning front, cases of haphazard knowledge acquisition, low mastery of knowledge, poor grades, and non-attendance of lectures had been reported. However, these reports were a

generalization of all higher institutions in Uganda but not specific to Kyambogo and Makerere universities thus the need for an independent study.

1.2   Statement of the Problem

According to Babu and Sridevi (2018), the use of ICT in teaching and learning is crucial because it may increase the calibre of the educational experience, broaden the reach of every lecturer, establish online communities of practice, encourage greater engagement, and promote more equitable access to higher education. ICT usage flourished in educational institutions in Uganda as they opened gradually in September 2020 following the COVID-19 pandemic though, students' reception towards it varied NCHE(2020) despite the fact that universities were already equipped with resources that may support online teaching and learning (Mugizi & Nagasha, 2022). At Kyambogo University students denounced online education alleging that the majority of the instructors failed to provide them with any reading materials, some were utilizing yellow notes, not finishing their course material, ignoring students' inquiries, and holding up the release of course work results (Faraji, 2022, Shabomwe, 2021). Makerere University experienced a standoff over online learning between students and administration where students protested against the use of the online learning claiming that the administration was pressuring them to enroll in the courses and that the online format was ineffective, limited access to the MUELE platform due to high internet costs and the difficulty in obtaining digital links (Busein, 2021). Some lecturers' inability to teach online, as well as the need that students take tests even when the material had not been fully covered created demand for physical classes (Opio, 2022).This confluence of events raised uncertainties among education stakeholders on whether the adapted ICT strategies had created substantial repercussions on effective teaching and learning. As a

result, this study aimed at exploring whether the use of ICT affected effective teaching and learning in an independent study at Kyambogo and Makerere Universities.

1.3 Purpose of the Study

This study aimed at exploring the use of ICT and effective teaching and learning at Kyambogo and Makerere Universities.

1.4 Objectives of the Study

Specifically, the proposed study sought to;

i. Determine the relationship between the level of ICT literacy and effective teaching and learning at Kyambogo and Makerere Universities.

ii. Find out the relationship between ICT connectivity and effective teaching and learning at Kyambogo and Makerere Universities.

iii. Establish the relevancy of ICT infrastructure and effective teaching and learning at Kyambogo and Makerere universities.

1.5 Research Questions

i. What is the relationship between the level of ICT literacy and effective teaching and learning?

ii. What is the effect of ICT connectivity and effective teaching and learning?

iii. What is the relevancy of ICT infrastructure and effective teaching and learning?

1.6   Research Hypothesis

H_{o1}: ICT literacy has no significant relationship with effective teaching and learning at Kyambogo and Makerere universities.

H_{o2}: ICT connectivity has no significant effect on effective teaching and learning at Kyambogo and   Makerere universities.

H_{o3}: ICT infrastructures have no significant relevancy on effective teaching and learning at Kyambogo and Makerere universities.

1.7   Scope of the Study

1.7.1 Geographical Scope. The study was conducted at Kyambogo and Makerere universities. Kyambogo University is located in a distance of about seven kilometers away from Kampala main city Centre. It is in the North West of Kampala, Kyambogo University coordinates on the map of Uganda are 0.350000 latitude and 32.630000 longitudes. Makerere University is situated on Makerere Hill, in Kampala, the metropolis of Uganda, is built, roughly five kilometers to the north of the City Center. On the map of Uganda, Makerere University is located at latitude 0.334088 and longitude 32.573093.

1.7.2 Content Scope. ICT use was he independent variable conceptualized into ICT literacy (literate, moderately literate, illiterate), ICT connectivity (reliability, affordability, availability) and ICT infrastructure (hardware, software, number of ICT laboratories). The dependent variable was teaching and learning that was operationalized into delivery, assessment and resources. The intervening variable was the ICT policy at each University.

1.7.3 Time Scope. The three-year study's time frame was between 2020 to 2022. This was due to the extensive outcry for adoption of virtual teaching due to COVID-19 debut that greatly hit the physical meetings and classroom interaction was hampered (Fanelli et al., 2020).

1.8   Significance of the study

This study may be significant to different stakeholders in different ways as explained below;

The government may be required to spend funds to technology solutions in the higher education industry in order to deliver courses for an ever-increasingly diverse and scattered student population. It would lead to an adjustment in concentration from teacher-centered to learner-centered education, with educators being encouraged to develop courses that allow students to manage their own learning.

Educational institutions can be architecturally flexible and use ICT systems of instruction as a tool to support overall learning.

The Ministry of Education and Sports would adopt the study's recommendations to create national digital skills framework that will lobby government policies, programs, curriculum, and standards. The ministry of ICT may be directed to implement and install appropriate tools, software, and connectivity at all educational levels through federal policies and plans.

National Council for Higher Education may use the study findings to advance the surviving e-learning substructure by positioning and altering its computer workrooms to Virtual Learning Environment software. Ministry of Public Service and the Education Service Commission may be able to assist universities recruit more or enough skilled technical experts to ensure all ICT systems for instruction flow efficiently.

The study findings will be essential to the researchers as they will help them to draw possible recommendations on how best ICT aided teaching may be improved as a technique of enhancing teaching and learning.

1.9   Conceptual Framework

Independent variable: ICT usage   **Dependent Variable: teaching and learning**


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┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│            LITERACY             │          │            DELIVERY             │
│  - Literate with ICT            │          │  - Monitoring                   │
│  - Moderately knowledgeable with│          │  - Selecting effective. Methods │
│    ICT.                         │          │    (group Work, Google meet,    │
│  - ICT Illiterate               │          │    LMS, social Media methods.   │
└─────────────────────────────────┘          └─────────────────────────────────┘

┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│          CONNECTIVITY           │          │           ASSESSMENT            │
│  - Available                    │          │  - Well-structured questions.   │
│  - Reliable                     │          │  - Collaborative /group         │
│  - Affordable                   │          │    assessment/projects and open │
│                                 │          │    book exams.                  │
└─────────────────────────────────┘          └─────────────────────────────────┘

┌─────────────────────────────────┐          ┌─────────────────────────────────┐
│          INFRASTRUCTURES        │          │            RESOURCES            │
│  - Hardware                     │          │  - Sharing resources            │
│  - Software                     │          │  - Appropriate selection of     │
│  - Number of laboratories       │          │    resources.                   │
│                                 │          │  - Effective use of open        │
│                                 │          │    education Resources.         │
└─────────────────────────────────┘          └─────────────────────────────────┘
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Intervening variable

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                    ┌─────────────────────────────┐
                    │         ICT policy          │
                    └─────────────────────────────┘
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Fig. 1.1: Conceptual Framework *Showing Teaching and Learning using ICT*
Source: Adapted from Munna and Kalam (2021) and modified by the researcher

The conceptual framework Figure (1.1) shows that the independent variable ICT was operationalized into ICT literacy covering the level of knowledge i.e. literate, moderately knowledgeable and illiterate, and ICT connectivity with internet availability, reliability and affordability and ICT infrastructures covering hardware, software and number of ICT

laboratories. The dependent variable was teaching and learning operationalized into delivery (monitoring the teaching and learning process, selecting effective delivery methods like group work , social media, LMS and others), assessment (well-structured questions ,collaborative and group assessment, projects, open book exams) and effective use of online resources (appropriate choice of resources, sharing resources). Similarly, once ICT is effectively implemented in teaching, learning will improve through skills development, knowledge acquisition, and content mastery, achieving good grades and actively participating in the teaching and learning process. The intervening variable was ICT policy at each university. However, failure to properly employ ICT into the teaching and learning process will mean that the reverse is true. ICT application to teaching and learning was highly dictated by the components of the diffusion of innovation theory of relative benefit, compatibility, complexity, observability, and trialibility.

1.10 Operational Definition of Terms

Information communication Technology (ICT): According to Pratt (2020), ICT a fusion of any connectivity gadget, such as television, mobile phones, desktops and network hardware and software, satellites plus the application areas that are attributed with them, such as video streaming and e-learning. In this study, ICT means use of both hard ware (desktops, laptops, and smartphones) and software for example online platforms to aid teaching and learning.

Teaching: The concept of teaching, according to Jaggars (2014) consists of three steps: Systematic review, diagnosis, and authoring of objectives are all part of the teaching cycle. Teaching is elucidated as the quality of technologies arising out of assessment, effective use of study materials, and effective feedback/communication as per this study.

Learning: Munna and Kalam (2021) defined learning as a permanent change. In this study, learning means the process of acquiring knowledge through physical or virtual interaction with the lecturers.

Teaching and learning: In this study, teaching and learning means the process of delivering content by lecturers and ensuring the students receive and interact with it, doing assessment either physically or virtually through online platforms like Google meet, YouTube, KELMS, MUELE ,Google class among others.

<center>**CHAPTER TWO**</center>

<center>**LITERATURE REVIEW**</center>

2.0   Introduction

Auriacombe (2016) defined a literature review as a review of academic work, books, and other causes relevant to a specific topic. Theoretical review was in relation to study objectives. Review of related literature was on effective teaching and learning using ICT.

2.1   Theoretical Review

The Diffusion of Innovation (DoI) theory is a societal procedure that displays instinctively alleged gen about a fresh notion. It is predicated on the assumption that a revolutionary invention, practice, or object has discernible routes, periods, and tendencies of adoption by persons (Tolba & Mourad, 2011). The process of gradually distributing a novel idea, concept, or technology into a social system is known as "diffusion of innovation."DOI is a hypothesis that explains by what means, in which way and how fast the innovation and inventions disseminate across communities, on both an individual and organizational level (Oliveira & Martins, 2010). Traditional innovation diffusion in a formal setting necessitates current management mobilizing and motivating employees to embrace initiatives, which they can do by providing appropriate coaching and technical assistance, as well as securing supervisor approval for a dialogue and collaborating climate (Senge et al., 1999).

Peansupap and Walker (2003) identified eleven factors that affect ICT execution and integration, which were then classified as organization (O), individual (I), and technical (T) group variables influencing ICT propagation, with each of these being influenced by the workplace environment (E). The diffusion process is categorized into four main concepts: creativity, communication channel, time, and social system. DOI is made up of five parts:

awareness, argumentation, choice, execution, and validation (Sang & Tsai, 2009). The theory provides a basis that can foster guidance and understanding the components that impact the viability of an innovation within a social system. The approach emphasizes that treatments must be tailored to key stated requirements, attitudes, and views of individuals (Dingfelder & Mandell, 2011).

Rogers made a distinction between proactive and gradual progress inventions (non-preventive). A proactive invention is a novel idea that someone believes would reduce the likelihood of a bad event. Since preventative innovations are generally sluggish to catch on, their relative advantage is uncertain. Incremental developments, on the other extreme, provide benefits in a timely fashion (Sahin, 2006). People who are courageous be the first to test new ideas. People who are interested in trying new technologies and judging their utility in society, those who pave the charge for the implementation of an innovation in mainstream society and are members of the general public, those who follow suit to make innovation a part of their day-to-day lives, as well as those who appear to be slow in appreciating the new innovation are the main people in the theory. The spread of an innovation through mainstream society eventually makes going about their ordinary routine impossible for them (and work) without it (Brandtzaeg & Folstad, 2017).

According to the Perceived Attributes Theory, potential adopters evaluate an invention based on their perceptions of five attributes: testing, observability, relative advantage, difficulty, and compliance. Relative advantage is the standard means via which an idea is evaluated to be a better than the option it replaces. The relative advantage might be quantified in form of money, reputation, handiness or happiness and accordingly, the superior the alleged benefit of ICT tools by teachers and students, the faster its adoption. The stage at which an initiative is seen as being

interoperable values, prior beliefs, and demands of likely users is known as compatibility. An innovation will be adopted more quickly if it is more compatible with the established social order since people won't have to initially accept a different set of desirability (Rogers & Scott, 1997). According to Wang and Lin (2021), "compatibility is the degree to which development is perceived as reconcilable with the past experiences, needs, and prevailing beliefs of likely users." ICT use by an individual may suffer if it is not aligned with their personal needs.

Complexity, according to Singh and Mishra (2008) is the level at which a change is considered relatively difficult to comprehend and apply. When the rate of adoption is negatively connected, an innovation's excessive complexity is a serious impediment to its adoption. If ICT adoption and usage poses many obstacles for teachers and students, for example, the process can also become tough, and vice versa. Complexity can be found in a variety of ICT components, such as infrastructure, which imply that if computer functionalities are subscriber friendly, they may be effective in implementing course materials and Influencing teaching and learning. According to Manan and Noordin (2014), trialability refers to how easily a new idea may be put to the test on a small scale. An invention's adoption rate increases with the number of times it is tried.

According to Rogers inventions with superior comparative benefit, compatibility, simplicity, trialibility, and observability could be employed sprightly than others, but it's challenging to have a fresh concept embraced, though it manifests clear benefits hence the existence of all these invention elements quickens the invention-diffusion process. The key motivator in the adoption and diffusion of ICT is role modeling or peer observation.

Yang et al. (2016) Communication channels are an element of DoI theory that refer to the steps by which data about an intervention are disseminated among individuals of a social

environment. Information surrounding the invention must be conveyed so as to present it, adjust beliefs about it, sway judgments about it and support appraisal of it (Rogers & Scott, 1997) and the major channel of communication about ICTs has been these technologies themselves (Ezcan et al., 2020).

2.2   Conceptual Review of teaching and learning

Bower and Beeman (2014) defined teaching as the positioning of oneself in a situation where there are obstacles that they opt to conquer and learn from. Additionally, Bhuasiri et al. (2012) defined teaching as a type of persuasion intended to alter another person's behavioral potential. Bwire et al. (2020) summarized teaching as a scientific process with its major components being substance, collaboration and response. Since it is thought that teaching has a beneficial impact on students' learning, it is always possible to alter, enhance, and create new teaching-learning activities; as a result, the system is flexible.

Jaggars (2014) underlined steps in the total framework of teaching including preparation for instruction entailing topic analysis, goal identification, and writing. While management of teaching-learning focuses on evaluating the learning objectives in terms of student performance and includes the design of teaching techniques for effective content communication and this information serves as feedback to both the teacher and the students. Munna and Kalam (2021) revealed that because an instructor applies certain methods in teaching students to develop particular abilities, change behaviors, or comprehend certain principles underpinning a learning environment, learning is regarded as an adjustment that is eternal in nature. Much as students are expected to have ownership over the learning session Alsalhi et al.(2019), they desire agreeable and entertaining instructors that communicate clearly and frequently use relevant examples to make the course material easy to follow (Asenahabi,2019). Munna and Kalam (2021)

summarized the learning process into phases i.e. student's experience, some organized reflection to sustain that the student is helped and learns from the experience and lastly identifying need for specific learning before gaining more experience.

Radio set, TV set, gadgets, computer and system hardware and software, satellite broadcasters, plus numerous services and apps linked, like live streaming and remote learning, are all examples of ICT (Pratt, 2020). ICT in teaching and learning include electronic devices such as video cameras, projectors, photocopy machines, scanners, and others that conform to all of the students' senses and feelings in order to assist the instructor in achieving the desired goals and objectives in learning and teaching within the timescale specified for students to comprehend in a special manner (Ojo & Adu, 2018). ICT is concerned with the storage, retrieval, manipulation, transmission and receipt of digital data through appropriately managing information with a considerable group of tools and resources hence contributing to national growth and development (Zafar, 2019). When implementing ICT, a number of elements ought to be taken into consideration, including how successfully students and instructors apply their ICT knowledge, the fees associated with purchasing IT equipment, the self-worth of the ICT user, personas, demonstrating attitudes, ICT proficiency, sexual orientation, knowledge of the subject, stress, institutional traits, career growth, ICT accessibility, aid with technology, managerial backing, and technological parameters (Buabeng-Andoh, 2012).

Policy, according to Jennings (1977) is a guide for selecting the optimal course of action to adopt in future in order to accomplish a specified goal. ICT recruitment has historically been coordinated by Ministry of Education and Sports, which has set aside funds to support the implementation of its ICT policy Farell (2007), as a result, Uganda adopted its first national ICT policy in 2003 with the second Objective in the policy directed towards addressing knowledge

enhancement and social resource capacity-building with tactics that included ICT integration in all education institutions, development of ICT centers to provide ICT training and enhancing skills transfer among others. The reasons for the formation and development of Makerere University's ICT policy were to offer operative ICT sustenance that is responsible to the university's educational, exploration, and managerial functions, to bond efficacious use of ICT resources, to advertise and promote an echo - friendly approach to the acquisition, utilization, and disposal of ICT resources. Kyambogo University, the overall expectation was that ICT shall enable the university achieve its vision and mission which is in line with the university strategic plans, national development plan and national vision 2040 aimed at promoting utilization of ICTs for sustainable development (Lubaale, 2020). For both universities, the ICT policies clearly spelt out certain groups of people whose roles and responsibilities relative to the policies were clarified.

Kikonyogo (2021) carried out a study on enhancing the usage of digital literacy by Kyambogo University's teaching faculty on the e-learning management system (KELMS): a case of masters in occupational education. The results on impact of improving the use of KELMS in teaching and learning processes revealed that digital illiteracy affect use of KELMS in teaching and learning processes. To that effect, it's strongly recommended that students, facilitators and mentors should have continuous hands on training on LMS to acquire practical skills. MVP administration should digitalize all teaching content and be accessible via online and make sure that LMS is included on timetable so that every week there is facilitation on LMS so that skills acquired are practiced.

2.3   Relationship between the Level of ICT Literacy and Teaching and Learning

Makhmudov et al. (2020) carried out a study on Computer literacy as a scheme to the system of innovative cluster of pedagogical education in Tashkent Region and results revealed that the younger generation knows to use modern technology more than teachers and they have ability to learn them quickly. Similarly, Zafar (2019) investigated the role of information communication technology (ICT) education and its relative impact and findings revealed offered new opportunities to learners and educators from multiple backgrounds by enhancing their achievements and performance at all educational levels. The author argued that learners and educators should be trained on how to operate and use the different ICT tools in order to enhance their ICT literacy levels.

Hafifah and Sulistyo (2020) investigated teachers' ICT literacy and ICT Integration in extract, load and transform (ELT) in the Indonesian higher Education setting, findings found that over 60% of respondents had above-average ICT skills and frequently used it in their teaching. Results also revealed that there was a significant correlation between ICT Literacy, experiences on teaching and learning in Indonesia. The study recommended continuous training for teachers and institution of a stronger ICT policy. Additionally, Olatoye et al. (2021) investigated ICT literacy skills proficiency and experience on the use of electronic resources amongst undergraduate students in selected Eastern Cape Universities in South Africa and descriptive results frequencies revealed that 70.6% of the study respondents confessed under-utilization of electronic resources arising from low levels of ICT proficiency while a fair number of respondents lacked ICT exploiting knowledge. The authors asserted that to improve undergraduate students' ICT literacy skills universities must create platforms and media which can be utilized by students to enhance proficiency and experience in using ICT in learning.

Fidelis and Onyango (2021) carried out a study to establish the availability of ICT facilities and teachers' competence in the use of ICT among public secondary schools in Ngara, Tanzania and the findings found that majority of teachers lacked technical knowledge in any manner especially in the use of some ICT facilities such video conferencing and digital technology. Mukhari (2016) studied teachers' experience of information and communication technology use for teaching and learning in South African schools and findings demonstrated that a deficiency of ICT talents, a stumpy level of ICT capability, and insufficient ICT training had a detrimental impact on the employment of ICT in the teaching and learning process.

Similarly, Nikou and Aavakare (2021) assessed the interplay between literacy and digital technology in higher education among university professionals and students, the results revealed a complex interaction between literacy abilities and digital expertise. Nwosu (2018) conducted a study on the relationship between undergraduate students' ICT competence and literacy abilities and teaching and learning efficiency in Ogun State, Nigeria and findings revealed that 80% of undergraduate students possessed elementary ICT literacy abilities, which included the capacity to locate and acquaint information resources for their research and the use of ICT was shown to increase students' academic performance. The study found out that ICT competence and literacy abilities had a positive and significant relationship with teaching and learning in Ogun State.

Opati (2013), who conducted research on Makerere University's use of ICT in teaching and learning, the results of the study showed that formal academic ICT use at the College is rather limited. The latter is generally employed as a tool for organizing records, planning lectures, and socializing. The findings also showed that the College's ICT environment is full of difficulties that prevent it from being fully incorporated into teaching and learning. Students in Palestinian public schools perceived ICT to have a moderate impact on their learning, according

to Qadduni et al. (2021) in a study evaluating the impact of ICT on teaching and learning from the perspective of Palestinian students and teachers.

Therefore, the literature gap in the provided set of literature includes the need for research specifically conducted at Kyambogo University and Makerere University, as well as a focus on effective strategies or interventions to improve ICT literacy among teachers and students in these institutions since none of these studies considered these two institutions in an independent comparative study.

2.4   Effect of ICT Connectivity on Teaching and Learning at Kyambogo and Makerere Universities

Asio et al. (2021) studied internet connection and learning device availability of college students at a local higher education institution in Central Luzon, Philippines. Results revealed that 70% of the students had access to internet and the most accessible learning devices were the smartphones. Chirwa (2018) studied access and use of internet in teaching and learning at two selected teachers' colleges in Tanzania and with use of descriptive statistics results revealed that 61.3% were using internet for games and entertainment, for searching academic works 83.2% and 43% for social work. The author argued that for effective teaching and learning, students and teachers should access and use of internet at all cost everywhere in the college as it facilitates the learning process.

In a research on internet utilization and its impact on senior high school pupils in Ghana's WA Municipality by Yebowaah (2018) results revealed that internet sources for the students and teachers included the School computers, computer laboratories, mobile handsets, domestic internet amenities (free wireless internet), and communal internet cafes. Fidelis and Onyango (2021) carried out a study to identify the availability of ICT infrastructure and instructors' ICT

skills among public secondary schools in Ngara, Tanzania and findings indicated that Internet connectivity was one of the serious challenges affecting ICT use on the teaching learning process. The study revealed that internet connectivity had a positive and significant effect on teaching and learning among public secondary schools in Ngara, Tanzania.

Teachers' barriers to using information and communication technologies were investigated by Kristiawan and Muhaimi (2019) and results revealed that 75% of teachers were not adept in utilizing technology-based media, despite the fact that one of the activities that support computer-based media is using computers. Likewise Vaicondam et al. (2021) looked into College Students' attitudes and information and communication technology-based education planning and findings revealed that that the more students are exposed to ICT, the more positive their attitude towards technology developed. During the COVID-19 emergence in Nigeria, Azubuike et al. (2021) investigated the digital divide in learning particularly in Nigeria and findings revealed a link between societal and financial position and the digital gap in inaccessible learning areas. The authors argued that for effective integration of ICT in learning the institutions should provide internet with fast speed as well as intranet connections as these would effectively aid in the teaching-learning process. A study on digital inequality at home was conducted by González-Betancor et al. (2021) in 21 European nations and findings found that frequency and quality of ICT use at home was influenced more by ICT integration at school than by the family's socioeconomic status, while in certain countries the social factor had no impact.

In an English medium instruction (EMI) institution, Ahmed and Roche (2021) investigated the relationship between undergraduate students' digital literacy and academic success in a national public institution in Gulf state and findings revealed that focus groups were analyzed to determine students' access to and use of digital technology in order to better

understand how digital literacy development may help academic achievement. Furthermore, during COVID-19, Hassan et al. (2020) conducted a critical review by teachers on online teaching-learning and results revealed that because limited bandwidth and internet access in online teaching, professors found it difficult to offer online courses. At Makerere University in Uganda, Muyinda et al. (2010) conducted a study on the use of mobile phones for research supervision support. The findings showed that the mobile phone is an interesting and useful tool for promoting cooperative/collaborative learning in remote learning. However, in a heavily populated and developing nation like Uganda, where students are geographically spread, it is necessary to devote more time and money to creating m-learning solutions designed to support learners wherever they are at any given time.

Medical education and e-learning during the COVID-19 pandemic: awareness, attitudes, preferences, and challenges among undergraduate medical and nursing students at Makerere University in Uganda were researched by (Olum et al., 2020). The findings showed that whereas 95% of the participants owned smartphones, up to 39% did not. Additionally, more than 90% of the participants 97% had email addresses, 39% of participants who were asked to rank their internet access said it was of average quality, but up to a third said it was of low quality.

Asuman et al. (2018) conducted a study in Uganda using teachers' views to determine the hurdles to web-based learning (WBL) integration and alternative solutions. Teachers were willing to include WBL into the teaching and learning process, but they ran into issues such as sluggish internet speeds, a lack of web-based resources, and a lack of technical support, according to the findings.According to Das (2019), in a study on the role and impact of ICT in improving the quality of student learning, the growing use of ICTs as a tool of daily life is improving the quality of student learning by fostering collaborative learning, facilitating quick

and accurate feedback to learners, promoting deep learning, and allowing educators to better respond to different needs of different learners, in the teaching and learning activities, since students come from all over the world.

The effectiveness of the use of information and communication technologies (ICTs) in teaching and learning in Eastern Cape high schools was investigated by Ojo and Adu (2018) and findings revealed that ICTs promoted teaching and learning. Olaore (2014) in a study about the impacts of ICT on education in Nigeria revealed that the digital divide especially in the form of Facebook, twitter, YouTube, Instagram, Google meet and yahoo imposed a big cost on poor students since they served as distractors compared to effectiveness in learning .most times learners' minds were isolated from the core value of learning to other information provided there.

There was a gap in the literature regarding research having not been conducted within the context of Kyambogo and Makerere universities, which could provide valuable insights into the unique challenges and opportunities related to ICT connectivity in teaching and learning. Additionally, there was a gap in terms of in-depth exploration of the pedagogical implications of ICT connectivity on teaching and learning and there was a literature gap regarding students' perspectives on the use of ICT connectivity, including their experiences, challenges, and preferences.

2.5   Relevancy of ICT Infrastructure on Teaching and Learning at Kyambogo and Makerere Universities

Yuliani and Mercuriani (2021) studied drawbacks towards deploying of ICT in biology learning. Following a review of literature showed that the most common challenges was lack of ICT infrastructure that strained the occurrence of the teaching and learning process. Similarly, In

Meru, Kenya, Ntorukiri et al. (2021) evaluated the impact of integrating ICT infrastructure in Kenyan secondary schools on teaching and learning and results revealed that the influence of ICT application had not been appreciated probably due to the low investment in ICT infrastructure like software and hardware due to their high cost. Likewise in a study about internet use and its impact on senior high school learners in Ghana's WA Municipality, Yebowaah (2018) revealed that the main ICT infrastructures used in schools were information and communication laboratory equipped with computers and mobile phones owned by students and tutors. From the southern area, Maphosa (2021) explored instructors' opinions on remote-based teaching and learning in the COVID-19 era and teachers preferred to utilize smartphones and laptops for instruction rather than radio.

Ghasia et al. (2018) conducted research on the potential of movable learning deployment at higher education institutions a case of four universities in Tanzania and results revealed that mobile phones were widely used in universities as they enable students own up their learning. Fidelis and Onyango (2021) found out in a study of ICT availability among lower level schools in Tanzania's Ngara District, that the lack of ICT facilities and internet access hampered their integration in teaching and learning. Likewise Ricardo-Barreto et al. (2020) conducted a study with the goal of identifying and assessing trends in ICT use (hardware, software, and digital educational materials) among higher education professors in the Antioquia area of Colombia and findings revealed that there was a tendency toward increased use of laptop and desktop computers, followed by portable devices such as smartphones.

Likewise Gómez- Garcia et al. (2020) used Perceptions of Melilla's (Spain) Mathematics instructors to investigate the training and usage of ICT in teaching and results revealed that teachers had more options in selecting software than in selecting different hardware devices as

teachers merged technology with educational platforms to boost student learning in mathematics. Bariu (2020) researched the Status of ICT Infrastructure used in teaching and learning in Secondary Schools in Meru County, Kenya, and found that most schools had a meager outlay in ICT substructure owing to the hiked expenses of computer accessories. The study also revealed that ICT infrastructure had a positive and significant effect on teaching and learning in Secondary Schools in Meru County, Kenya. Al-Mamary (2022) investigated the factors influencing the use of ICT in teaching in Yemeni schools, and found that simple access to ICT infrastructure, availability of technical support team, effective power supply, time availability, and technology training was all major elements influencing teachers' technology use. Lawrence and Tar (2018) looked into the elements that influence teachers' use of ICT in the classroom and how they integrate it and findings demonstrated that having access to infrastructure was a clear requirement for being able to use ICT.

The results of a study conducted by Bakkabulindi (2011) to determine the relationship between ICT proficiency, age, and income level, and computer use among postgraduate students in Makerere University School of Education revealed that the use of computers by students was reported to be low and that failure to make the best use of computers by students in the University results in a number of unfavorable outcomes, such as money being wasted and computer facilities being ignored. A similar study was conducted by Okello-Obura & Magara (2008), who examined the use of digital resources by students at Makerere University in Uganda. The findings showed that most of these students study library and information science at Makerere University, but very few of them use the university's computers for their coursework. Most people who use electronic resources are self-taught. The analysis concluded that LIS

professors and university librarians must work together to promote usage of the library's electronic resources.

Edoru and Adebayoa (2019) carried out a study on Information and Communication Technology in Ugandan Higher Education: A Case of Makerere University and according to the descriptive analysis results, white boards (19.6%) were the most often used and installed hardware on the Makerere University campus in virtually every lecture hall. At Makerere University, the majority of professors used the Microsoft Access (19.0%) and Result Management System (15.3%) programs to oversee educational services .According to research on the suitability of ICT services, respondents agreed that library services are computerized and that lectures use e-mail to monitor pupils. The majority of respondents, according to the results of the ICT tool modernity survey, agreed that students using PCs can access lesson notes. Furthermore, the study found out that the ICT tools provided had enabled teaching by assisting students with no computer knowledge in understanding the hardware and software however ,some of the students could not cope with the latest technological innovation since most of them had not been exposed to ICT.

Hafeez (2021) conducted a review on teaching and learning process and ICT tools and findings demonstrated that modern tools considerably improved the teaching and learning process, making it critical to incorporate ICT tools into teaching and learning in order to reach the intended outcomes.

Literature gaps cited included a lack of specific research conducted at Kyambogo University and Makerere University, which limits our understanding of the unique challenges and opportunities related to ICT infrastructure in these institutions. Secondly, there is a need for further exploration of the impact of ICT infrastructure on specific subject areas or disciplines to

better understand its relevance in different academic contexts. The literature lacked in-depth examination of students' perspectives on ICT infrastructure, including their attitudes, preferences, and challenges.

Conclusively, none of the studies carried out a comparative analysis on the use of ICT in the instructional procedures of higher learning institutions in Uganda particularly a comparative analysis in the context of Kyambogo and Makerere universities. Additionally, not any of the studies used the diffusion of innovations theory and Some did not consider ICT literacy, infrastructures and connectivity in a single study as indicators of ICT thus it was because of these loopholes in the literature that the current study was carried out to fill the contextual, theoretical and conceptual gaps.

CHAPTER THREE

METHODOLOGY

3.0   Introduction

The section presents methods used to conduct this study. It covers the methodology, design of research, population of study, size of sample and selection of sample techniques, sources of data, measurement of variables, data collection tools, instrument quality, data analysis, data collection procedure and research ethical consideration.

3.1   Research Design

The study adopted a descriptive cross-sectional research design. This design is one that can be used to investigate a studied problem or phenomenon at a certain point in time Taherdoost (2016) thus the researcher was able to use this concept of study to explore effective teaching and learning using ICT at Kyambogo and Makerere universities within a given time period. The design employed a mixed methods research approach which included the use of both quantitative and qualitative data collection and analysis research techniques in a single investigation (Cresswell, 2014). In a mixed method study, researchers gather and interpret data using both quantitative and qualitative methods Cresswell (2014) and the goal of employing a mixed-methods research strategy was to fully comprehend the topic.

3.2   Study Population

The study targeted a population comprising of students, lecturers and administrators from Kyambogo University and Makerere University. Lecturers were considered since they are the ones who carry out the teaching and students are the direct beneficiaries of the teaching process.

Administrators were involved because they know the context of teaching and also monitor the learning process of students.

3.3   Sample size

The research sample size was categorized in accordance with Kyambogo University and Makerere University. The sample size of students was 360 and that for lecturers were 27 determined using the kreicje Morgan (1970) table of sample size determination to ensure consistence and coherence. The sample size for key informants was obtained after data saturation.

The breakdown is as in Table 3.1.

Table 3.1:   Population, Sample Size, and Sampling Techniques

Institute	Category	Study Population	Sample size	Sampling Technique
Kyambogo university school of arts and social sciences	Students	200	132	Stratified Random Sampling
	Lecturers	18	15	Purposive
	Dean	01	01	Purposive
	Heads of Departments	05	05	Purposive
Makerere university School of Education	Students	550	228	Stratified Random Sampling
	Lecturers	13	12	Purposive
	Dean	01	01	Purposive
	Heads of Department	05	05	Purposive
	Total	793	399	

Source: Office of the Academic Registrar Kyambogo University (2022); Directorate of information and communications technology Makerere University (2022)

The sample size was 399, as per the chart that was computed using Krejcie and Morgan's sample size determination table of 1970 and as per the chart ,this sample size chosen is considered fit.

3.4   Sampling Procedure

The study adopted a multistage sampling method which comprised of both quasi and probaility sampling techniques. The first stage of sampling comprised of dividing the two institutions into different clusters (faculties). Then, out of the total faculties, the school of arts and social sciences and college of education were chosen from Kyambogo and Makerere universities respectively. The researcher then employed simple random sampling to select students from the faculties offering bachelor of arts with education in each of the institutions to participate in the study. According to Elfil and Negida (2017) each individual in the study population must have a possibility of being chosen for the study sample via simple random selection.

Further, the researcher adopted purposive sampling to choose lecturers teaching foundational subjects and key informants (KIs) who participated in the interviews as it permits the overall study population to be included in the study sample and is linked with higher aspects of data accuracy (Singh & Masuku, 2014). Key informants for interviews consisted of administrators from both Kyambogo and Makerere universities constituting of a total of 12 individuals (Heads of Department [HoD] Education, Dean Faculty of education). The KIs provided in-depth information about the study phenomenon which was obtained through face-to-face interactionss with the researcher. The number was determined by the concept of saturation Hennink and   Kaiser (2020) and this number at each institution either increased or decreased depending on when the saturation was reached.

3.5   Data Collection Instruments

The study collected data using a self-administered questionnaire for students and lecturers and interview guide for key informants.

3.5.1 Structured Questionnaires. According to Thomson et al. (2004), self-administered questionnaire for lecturers and students was the primary data collection instrument because it minimizes time and provides a researcher with a massive volume of data. The background factors were covered in Section A of the self-administered questionnaire, and teaching and learning was covered in Section B, while section C focused on the independent variable i.e. ICT literacy, ICT connectivity and ICT infrastructure. The items on this questionnaire were Likert scored, with 1 indicating strong disagreement, 2 indicating disagreement, 3 indicating uncertainty, 4 indicating agreement, and 5 indicating strong agreement. The results were sheltered from the researcher's bias by using a self-administered questionnaire. It also contributed to the rapid distribution of surveys to a large number of people.

3.5.2 Interview Guide. To acquire qualitative data from the respondents, interview guides were employed. To facilitate interviews with deans, heads of departments, and ICT employees, the researcher constructed open-ended questions in the interview guide. The researcher asked questions that compelled respondents to provide data so as to attain the study's objectives, as well as probe the respondents to explicate the required responses. According to Asenahabi (2019) interviews are beneficial because they provide in-depth information that is difficult to obtain via quantitative methods and these were conducted by the researcher. Key informants for interviews consisted of administrators from both Kyambogo and Makerere universities constituting of a total of 12 individuals (Heads of Department (Education), Deans Faculty of education).

3.6   Procedure for Data Collection

After proposal approval, an introductory letter was obtained from directorate of research and graduate training granting permission to collect data. The researcher presented the introduction letter to the office of the academic registrar Kyambogo University and the office of the academic registrar Makerere University who granted written permission to the researcher to permit data collection from selected departments. The researcher presented the letter to the respective heads of department at each institution that provided access to the various respondents. Student respondents were gotten through class coordinators where students were offering foundational subjects were asked to randomly take part in the activity while lecturers and key informants were selected for the study based on their availability and willingness to be interviewed. More informers were selected from each university and interviewed individually until the researcher reached data saturation.

3.7   Measurement of Variables

A measurement refers to a feature that evaluates a given element and can take one or more values. To aid the establishment of a concept index, both the independent and dependent variables were synthesized into observable and measurable components via statements applicable to the variables in this study.

Table 3.2:   Operationalization of Variables, Scale, Sources and Reliabilities

Variable	Nature of variable	Indicators	Scale & item	Source & reliability
Teaching & learning	Dependent	Delivery Assessment Resources	Ordinal	Proctor et al. (2003). α = 0.76, 0.72, 0.94 0.74
ICT	Independent	Literacy Connectivity Infrastructures	Ordinal	Akbulut et al. (2007). α=0.855,0.819,0.824
Policy	intervening	Policy	Ordinal	Akbulut et al. (2007). α=0.689

3.8   Quality Control

Quality control is about validity and reliability of instruments. Validity and reliability were attained for both quantitative and qualitative data.

3.8.1 Validity. As per Amin (2005), validity describes the level to which data gathered using research instrument items precisely reflects the real topic area of investigation and provides authentication that the collecting equipment is measuring what it's expected to be measuring. The validity of the questionnaire was ascertained by expert judgment by the help of the two supervisors such that the coefficient of validity was at least 0.7 as stated by Amin (2005). Therefore, the research instruments were considered valid only if the validity index was equal or greater than 0.7. The researcher made advantage of a Content Validity Index (CVI) to measure the validity of the instrument given by;

$$CVI = \frac{\text{No. of items declared valid}}{\text{Total No. of items}}$$

$$CVI = \frac{22}{26} = 0.85$$

It can be concluded that the questionnaires was valid for data collection since the CVI of 0.85 was above the suggested value of 0.7 according to Amin (2005).

To attain validity of the interview guide, the researcher used content validity approach. Feedback and input from supervisors who are subject matter experts was gained through expert review. The evaluation focused on the scope, objectives, and desired outcomes of the research study and recommendations were provided for refining the wording of the questions and incorporating additional relevant sub-questions. Iterative refinement where based on the feedback received, the interview guide was revised to ensure that the questions align closely with the research objectives and adequately capture the factors affecting the use of ICT in teaching and learning. Re-evaluation where the revised interview guide was shared with the supervisors to seek their feedback and ensured that there was a consensus reached thus content validity was enhanced. A new survey instrument is evaluated for content validity to make sure it has all the necessary items and omits any that are not relevant to a particular construct domain (Lewis et al., 1995). The content validity ratio (CVR) was subsequently determined for each item using Lawshe's (1975) approach, which is a logarithmic change of a corresponding level of consensus on how many "experts" through a panel rank an item "essential". A CVI of 0.78 or higher indicates satisfactory content validity Almanasreh, (2019) and CVI=0.86.

3.8.2 Reliability. Reliability was established using the statistical Package for Social Scientists (SPSS) and scores were evaluated. The Cronbach's Alpha Reliability Coefficient for Likert-Type Scales test was employed to ensure the accuracy of quantitative data. According to Sekaran and Bougie (2016) certain experts demand an instrument to have a dependability of 0.70 or above

before employing it (based on a large sample). The test was regarded trustworthy as the results were over 0.7. In this case, reliability was established through triangulating the responses from qualitative and quantitative study cases and the more their responses were similar, the more reliable the instruments were.

Table 3.3:   Reliability Statistics

Cronbach's Alpha	N of Items
.844	22

The results from Cronbach's Alpha test present a coefficient value of 0.844 which is above the recommended value of at least 0.7, thus deeming the research instrument reliable for the study.

Reliability of qualitative data was attained by cross checking transcripts from data that was collected from interviewees during data collection process. Transcription involves translation or transformation of sound or image from recording to text. Cross checking transcripts of data helps to ensure that transcribed data does not harbour errors made whilst transcribing data (Cresswell, 2014). Cross checking of data helped to ensure that the transcribed data remained consistent without deviation from the original data obtained from recordings of interview after transcription. Cross checking transcripts also helped to minimise mistakes associated with transcription of data in qualitative studies.

3.9   Data Analysis

This section presents methods that were used in analysis of both quantitative and qualitative data as presented below;

3.9.1 Quantitative Data Analysis. The study adopted descriptive, correlation, regression and t-test analyses in analyzing quantitative data that was obtained using structured questionnaires from students and lecturers. Descriptive analysis was used in analysis of single variable data like demographics and variable statements. The researcher utilized Spearman's rank correlation analysis to examine the link between the independent variable (ICT literacy) and the dependent variable, drawing conclusions based on P-values and correlation coefficients to answer the study hypotheses. Spearman's Rank Correlation, according to Khamis (2008) measures the association or relationship between two ordinal or nominal variables. Additionally, linear regression analysis was employed to examine the effect of the independent variable (ICT connectivity) on the dependent variable so as to provide answers to the study hypotheses at a 0.05 level of significance. According to Bryman (2016), linear regression analysis can be used to assess how closely the dependent and independent variables are related. The linear regression analysis involved the use of a simple linear regression model consisting of the outcome and predictor variables. An independent sample t-test was employed to determine the overall comparison between Kyambogo and Makerere universities since according to Choudhray (2018) it highlights the considerable contrast between the means of two independent samples.

3.9.2 Qualitative Data Analysis. Thematic analysis was used to assess qualitative data. Thematic analysis is the process of finding common themes and patterns in a dataset in order to answer specific research questions (Creswell, 2014)). Thematic analysis involved the transformation of key informants' views, opinions, and perceptions by the researcher into themes or patterns in relation to the research questions. These were supplied in the form of verbatim citations to support the quantitative results collected from Kyambogo and Makerere Universities.

Data from interviews was analyzed using Creswell's (2014) six-step data analysis procedure. The first step, which involved organizing and arranging the data for analysis, involved transcription of interviews and focus group discussions to produce written transcripts. This step also included typing up field notes, cataloguing all the visual materials such as observation checklists, sorting and arranging the data. In order to consider the overall meaning and get a general feeling of the knowledge and ideas that the participants transmit, the second phase required reading through the data. Thirdly, coding of notes from the lesson observations and focus group discussions as well as interview transcripts followed, to reflect emerging ideas. In the fourth step, which is generalization, there was integration of codes, thereby generalizing to form broader themes. Fifthly, descriptions of the themes were provided to include quotable quotes (participants' voices) from the transcripts to illustrate them. The sixth step, which is interpretation, then followed, where relevant literature was used to make sense of, as well as support the themes. My past experience as a student influenced my interpretation of the participants' tales throughout the process. I paid close attention to what they were saying, the conclusions they came to, and their objectives for future practice in order to authentically represent the participants' perspectives of their experiences. After transcribing the collected data from interviews from each institution data redundancy was dealt with after no additional information was yielding different and relevant data hence reaching the point of saturation.

3.10   Study Limitations and Delimitations

The researcher had insufficient finances to cover all the expenditures that had to be accrued thus created a budget to suit the available funds. The research was affected by time pressures since the researcher had to concurrently carryout the study while working and yet limited time frame was provided for concession of the dissertation. The researcher created a structure and

timeline for allocating the available time to the successes of the various activities and followed the tasks' arrangement conscientiously. Some respondents were apprehensive to provide specific information as they looked at research as a threat to the organizational status and wastage of their time, the researcher, however made the questions and interviews as objective as possible and also avoided misleading questions.

3.11   Ethical Considerations

The research was made a perfomance with the awareness and approval of Kyambogo university and Makerere university officials. To begin with, the researcher attained an introductory letter from Kyambogo University, which she used to alleviate mistrust. The researcher then went ahead and selected respondents, as well as schedule delivery and pickup dates for surveys and interviews. The researcher acquired a permission letters from the academic registrars' offices at Kyambogo university and Makerere universites that along with the introductory letter from kyambogo university enabled data collection at the premises of the institutions.The researcher was responsible for maintaining the confidentiality of the respondents, which is crucial in research. Anonymity was highly prized as well through discouraging use of individual names but rather encouraged use of pseudo names. In addition, all citations reviewed in the work were recognized in the list of references, and the findings were given in their original form. Social distance, masking and sanitising was encouraged to save the respondents from getting infected with Covid 19.

PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1   Introduction

This chapter presents analyses and provides explanations for the study findings on the relationship between ICT usage and teaching and learning at Kyambogo and Makerere Universities based on the information obtained from the study questionnaires and interviews. The results include descriptive statistics, correlation, regression-test results and qualitative explanations.

4.2   Response Rate

The researcher examined the response rate of the respondents who participated in the study and the results are presented in Table 4.1.

Table 4.1:   Response Rate of Respondents

Category	Distributed	Collected	Response rate (%)
Interviews	12	9	75.0
Questionnaires (Students)	360	360	100.0
Questionnaires (Lecturers)	27	26	96.3
Total	**399**	**395**	**99.0**

Source: Primary Data (2022)

A total of 12 interviews were expected to be conducted but only 9 interviews were successfully conducted which gave a response rate of 75%. Additionally, a total of 360 questionnaires for students and 27 questionnaires for lecturers were distributed and of these all 360 questionnaires for students and only 26 questionnaires for lecturers were completely filled and collected which gave a response rate of 100% and 96.3% respectively. Therefore, a combined response rate of

99.0% was generated which is above the recommended 70% and this implies that the study sample was a good representation of the population according to Amin (2005).

4.3   Demographic Information of the Respondents

This sub section presents the demographic characteristics of the respondents who participated in the study presented in form of gender, age group, marital status, experience, rank, and institution.

4.3.1   Gender of Respondents. The study involved both male and female respondents from the two institutions comprising of both students and lecturers. The findings are presented in Table

Table 4.2:   Gender of Respondents

Gender	Frequency	Percentage
Male	177	45.9
Female	209	54.1
Total	**386**	**100**

Source: Primary data (2022)

Table 4.2 indicates that majority of the respondents 209(54.1%) who participated in the study were females while males constituted the least proportion 117(45.9%) in the study. This implies that more females were considered in the study compared to the males.

Figure 4.1: A bar graph showing gender of students
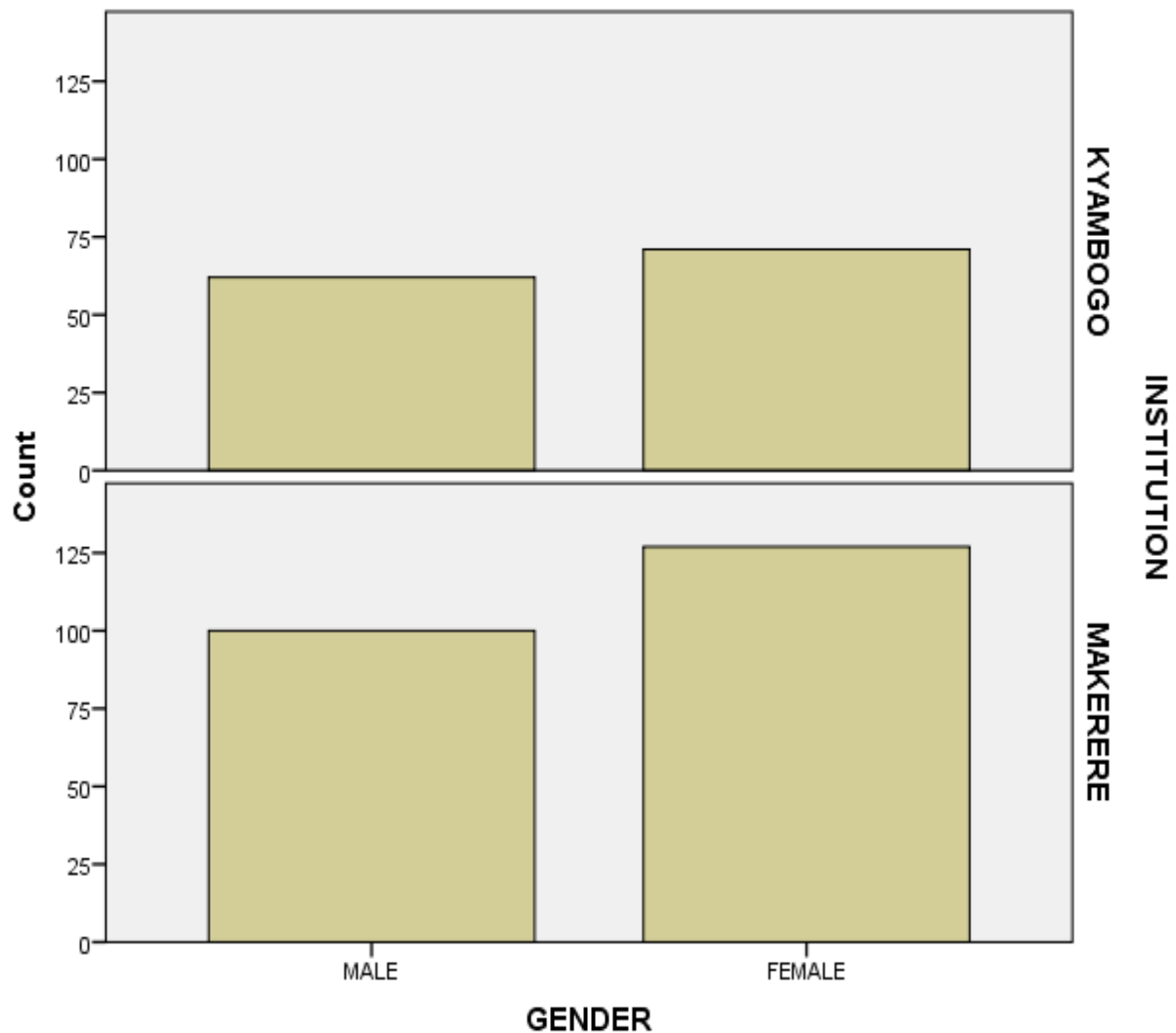
Source: Primary data (2022)

Figure 4.1 shows that there were more female respondents at Kyambogo university than male respondents (females=72, males=56), similarly Makerere university had more female respondents than male respondents (females=128, males=100). In summary more females participated in the study than males at both Kyambogo and Makerere universities.

4.3.2 Age Group of Students. The study involved students of different age groups ranging from 20 years and above. The findings are presented in Table 4.3.

Table 4.3: Age Group of Students

Age Groups	Frequency	Percentage
20-22 years	199	55.3
23-25 years	127	35.3
26-28 years	26	7.2
Above 28 years	8	2.2
Total	**360**	**100.0**

Source: Primary data (2022)

The findings in Table 4.3 revealed that out of a sample of 360 students who participated in the study, most of the students 199(55.3%) were aged 20-22 years, followed by 127(35.3%) students who were aged 23-25 years, then 26(7.2%) of the students who were aged 26-28 years, and the least proportion of students 8(2.2%) were aged above 28 years. This implies that the university are populated by more youth since majority of the students who participated in the study were aged between 20-25 years.

Figure 4.2:   A Bar Graph Showing ages of Students
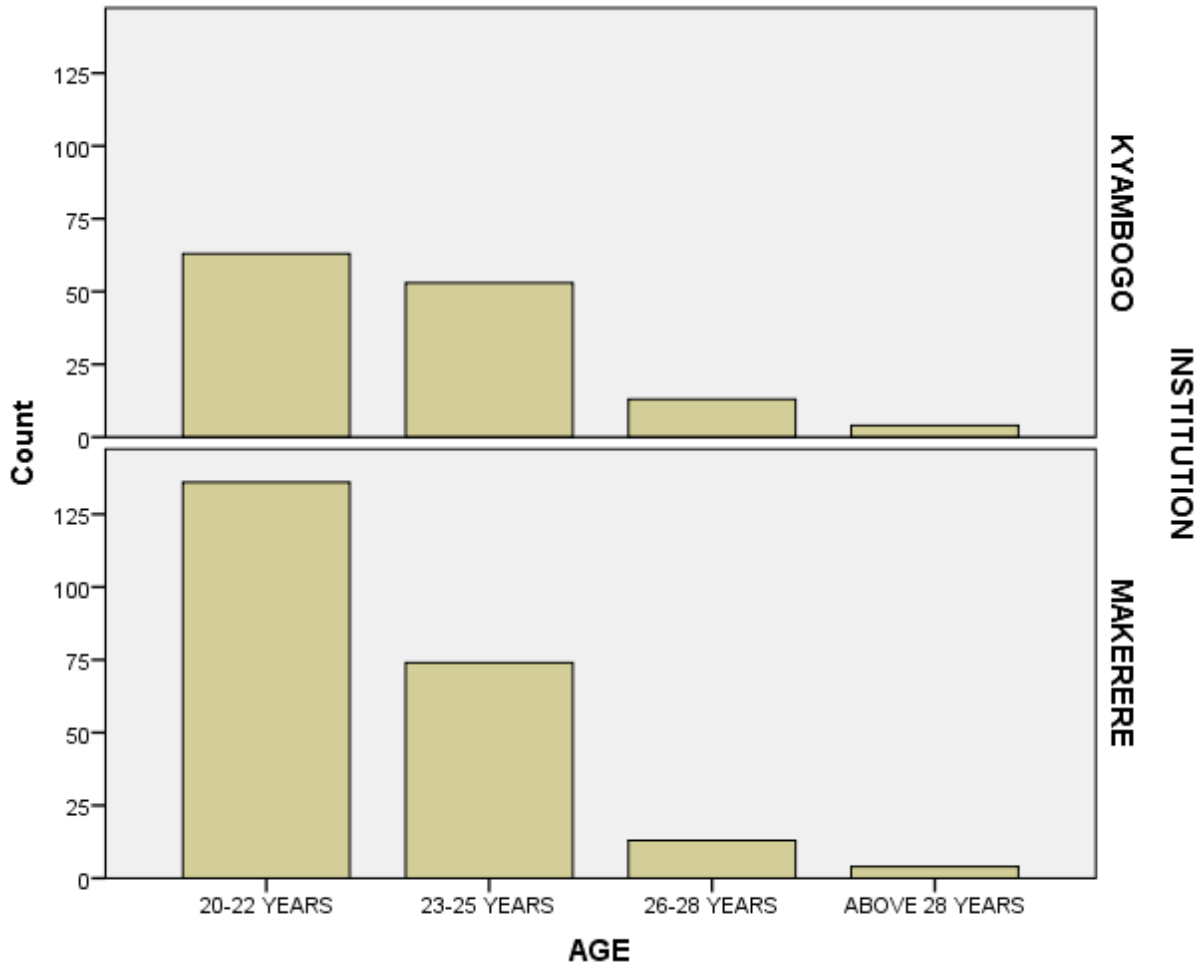
Source: Primary data (2022)

Figure 4.2 shows a comparison in the ages of students at Kyambogo and Makerere universities who participated in the study. The graph shows that students between 20-22 years participated more in the study at Kyambogo University. These were followed by those between 23-25 years at Kyambogo University followed by those between 26-28 years and the least to participate in the study were those above 28 years participated at Kyambogo University. The graph also shows that students between 20-22 years participated more in the study at Makerere University. These

were followed by those between 23-25 years, followed by those between 26-28 years and the least to participate in the study were those above 28 years participated at Makerere University.

4.3.3 Marital Status of Respondents. The study made an investigation on the marital status of respondents who participated in the study and this included both lecturers and students. The results are presented in Table 4.4.

Table 4.4: Marital Status of Respondents

Marital Status	Frequency	Percentage
Single	298	77.2
Married	74	19.2
Others	14	3.6
Total	**386**	**100.0**

Source: Primary data (2022)

The study results in Table 4.4 shows marital status of respondents where majority of the respondents 298(77.2%) who participated in the study were single, followed by 74(19.2%) of the respondents who were married, and the least proportion of the respondents 14(3.6%) were categorized under other marital statuses.

Figure 4.3:   A Bar Graph Showing Marital Status of Students
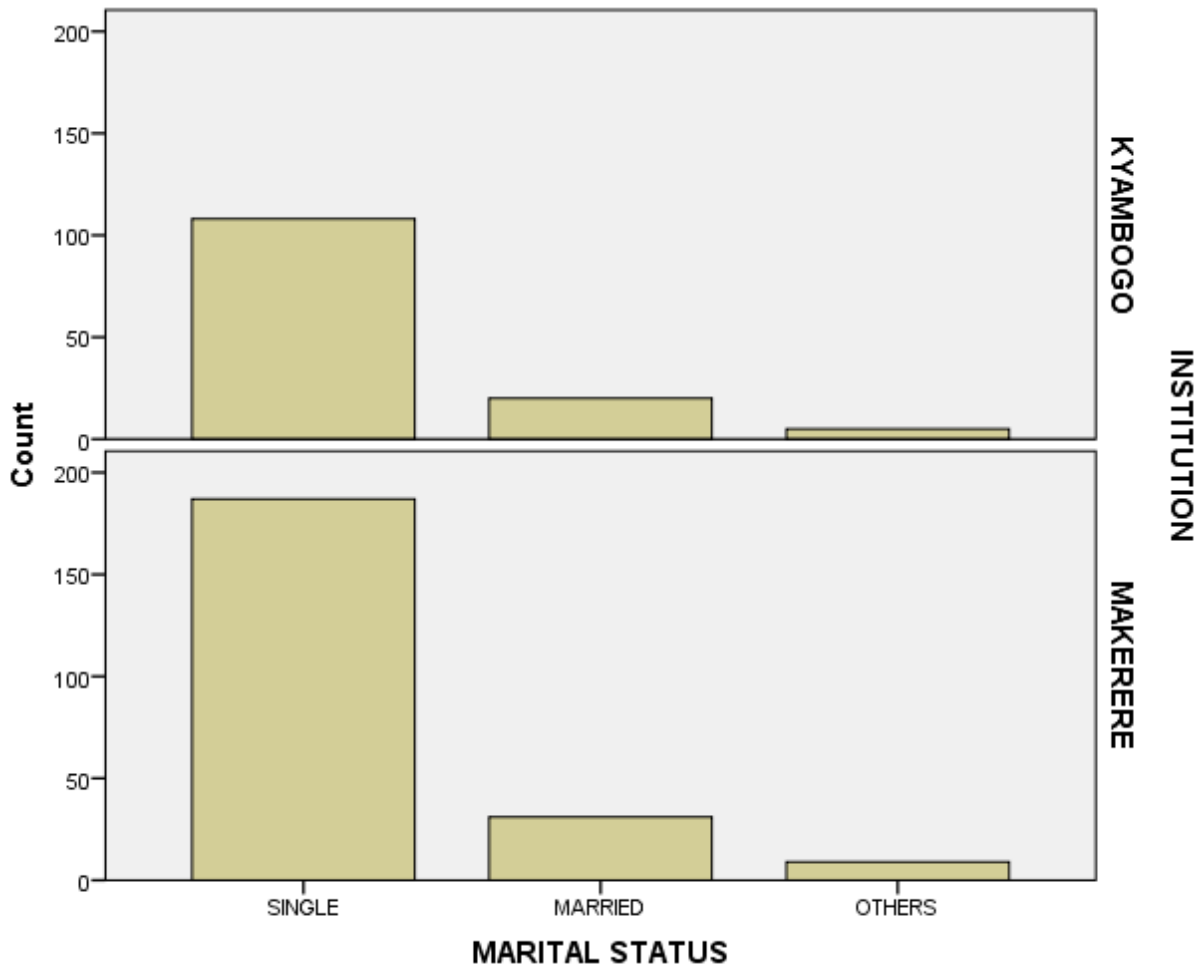
Source: Primary data (2022)

Figure 4.3 shows the marital status of student respondents from both Kyambogo and Makerere universities that participated in the study. Figure 4.3 shows that most students at Kyambogo University were single followed by those who were married and the least to participate in the study were those who belonged to other categories. Similarly, the graph shows that most students at Makerere University were single followed by more who were married and the least to participate in the study were those who belonged to other categories. However, students in all categories at Makerere University outnumbered those at Kyambogo University.

4.3.4 Institution of Respondents. The study sought to find out the institution from which the respondents who participated in the study studied or worked and the results are presented in Figure 4.4.
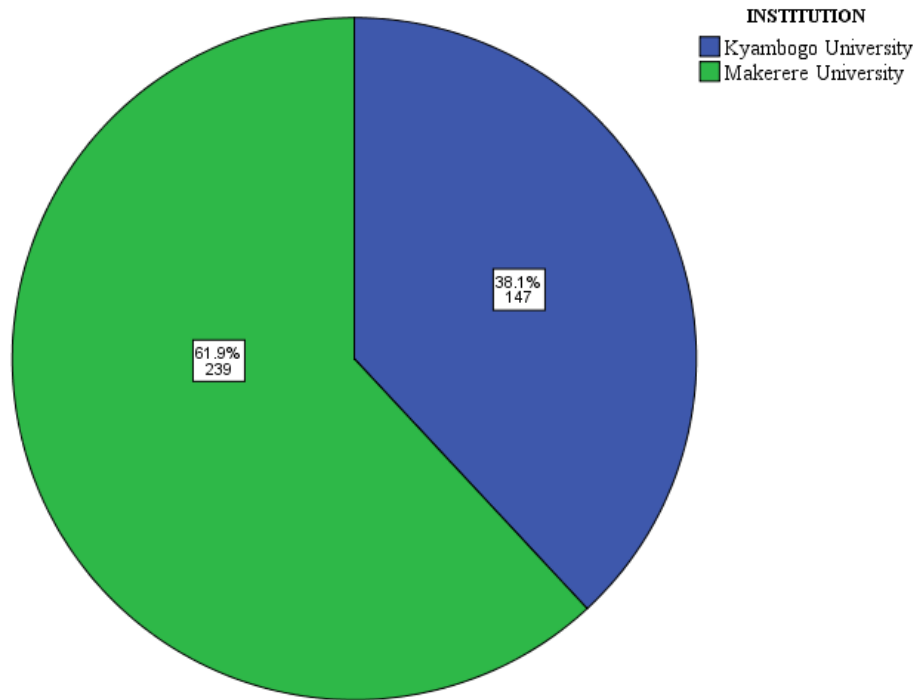
Source: Primary data (2022)

Figure 4.4:   Pie Chart showing respondents as per institution involved in the study

The results presented in Figure 4.4 show that majority of the respondents 239(61.9%) who participated in the study were from Makerere university compared to 147(38.1%) of the respondents who were from Kyambogo university. This could be due to the fact that Makerere University has a bigger population size than Kyambogo University.

4.3.5 Experience of Lecturers. The study sought to assess the experience of lecturers who participated in the study. The results are presented in Figure 4.5.

Figure 4.5: A Bar Graph on Experience of Lecturers
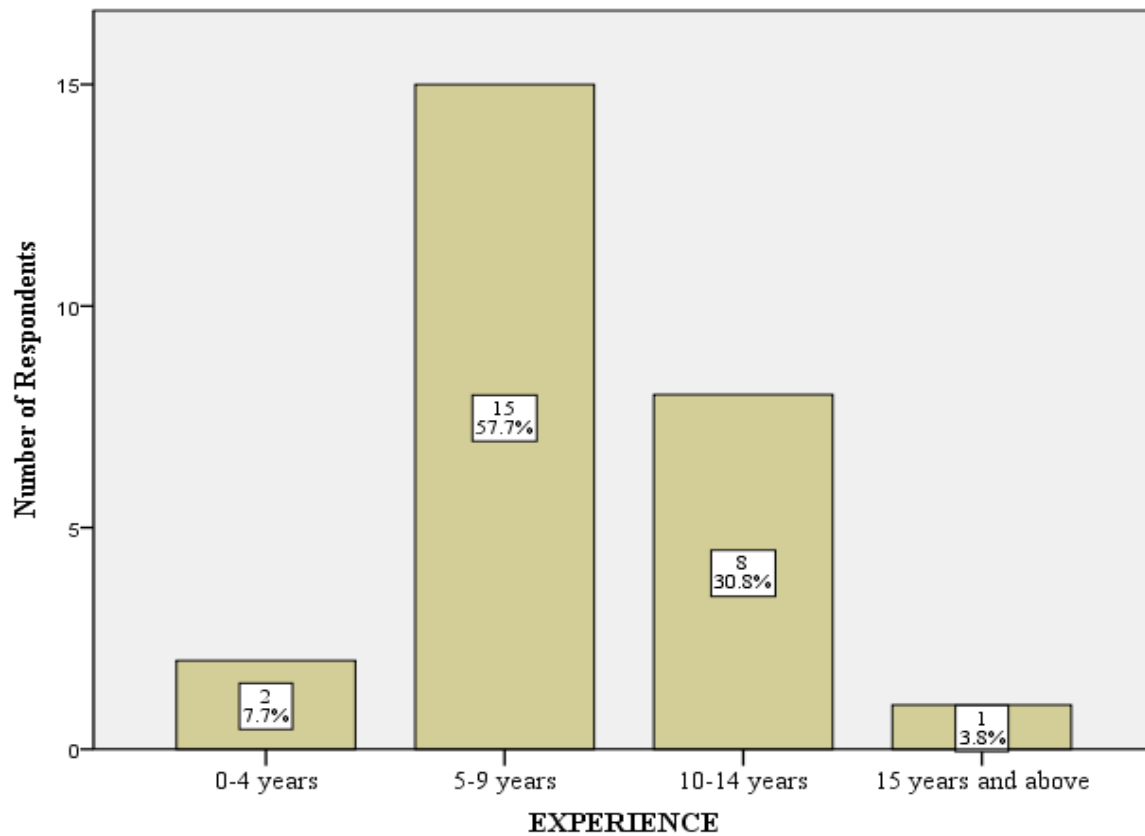
Source: Primary data (2022)

The findings in Figure 4.5 indicate that out of a sample of 26 lecturers who participated in the study from both Kyambogo university and Makerere university, a bigger proportion of lecturers 15(57.7%) had an experience of 5-9 years, followed by 8(30.8%) of the lecturers who had a 10-14 years' experience while the smallest proportion of the lecturers 1(3.8%) had an experience of 15 years and above. The findings imply that lecturers with good and enough experience were considered for the study and therefore would provide significant information pertaining to the study phenomenon.

4.3.6 Rank of Lecturers. The study also sought to assess the rank of lectures who participated in the study from both Makerere University and Kyambogo University. The results are presented in Table 4.5.

Table 4.5:   Rank of Lecturers

Rank	Frequency	Percentage
Lecturer	19	73.1
Senior lecturer	7	26.9
Total	**26**	**100.0**

Source: Primary data (2022)

The results in Table 4.5 revealed that out of a sample of 26 lecturers who participated in the study from both Kyambogo university and Makerere university, majority 19(73.1%) were ranked just as lecturers and a small proportion of them 7(26.9%) were ranked as senior lecturers.

Figure 4.6: A Bar Graph Showing Rank of Lecturers
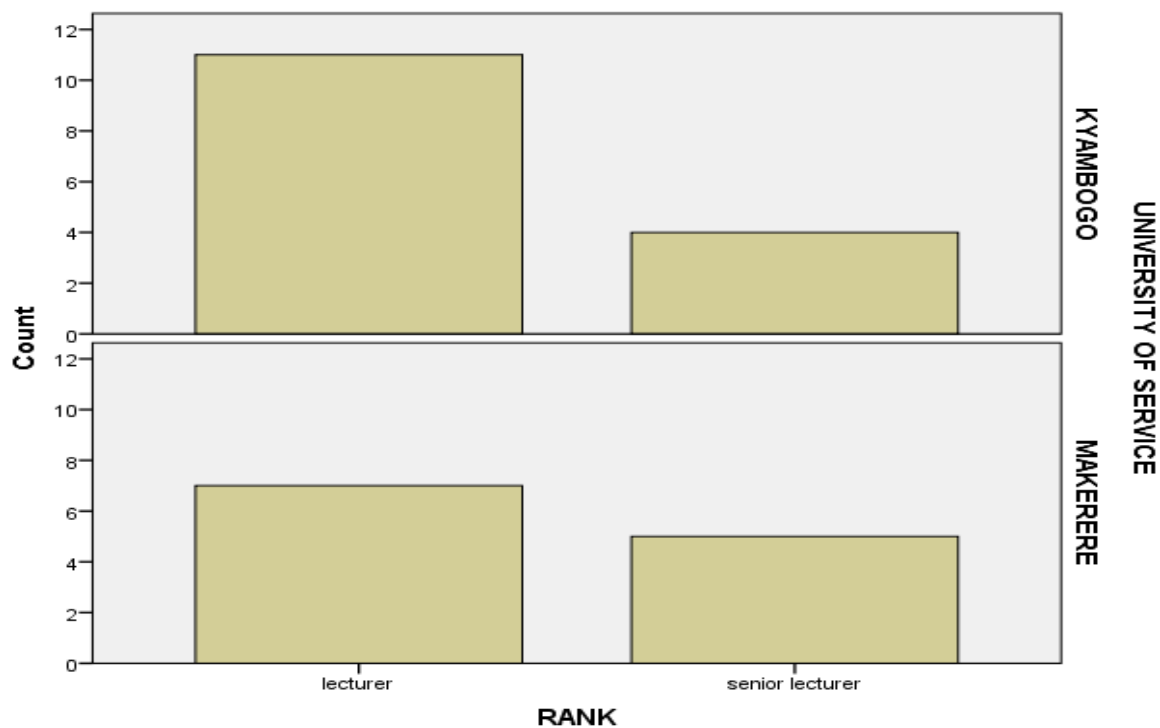
Source: Primary data (2022)

Figure 4.6 shows the comparison between ranks of lecturers who participated in the study at both institutions. The graph shows that there were more lecturers than senior lectures at Kyambogo University and Makerere University who participated in the study. However, there were more lecturers and senior lecturers at Kyambogo University than Makerere University who participated in the study.

4.4 Findings by Study Objectives

This section presents the findings on the study objectives. Before presenting the correlation analysis regression analysis and t-test on each objective, the researcher runs descriptive statistics which include percentages, means and standard deviations of different statements on each study variable.

4.4.1 Descriptive results on the dependent variable. The dependent variable was measured using a five point Likert scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree. A mean score result below the threshold of 3 suggests a disagreement while a mean score result greater than the threshold of 3 suggests an agreement by most of the respondents on a particular statement of the variable. These explanations provide a summary of the mean scores and standard deviations for each paragraph, along with the range of responses, indicating the general trend and variability in the participants' perceptions.

Table 4.6:   Lecturers' perceptions on teaching and learning at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
I prepare for teaching in advance before the semester begins	0	0	0	66.7	33.3	4.3333	.49237
ICT enables lecturers in effective planning and preparation	0	0	0	75.0	25.0	4.2500	45227
I give out course outlines at the beginning of the semester and follow it up till its covered relative to ICT	0	0	0	0	0	4.4167	.51493
the quality of course content is developed and selected appropriately using ICT	0	0	0	58.3	41.7	4.4167	51493
there is increased interaction and communication on academic matters between students and lecturers using ICT	0	0	0	58.3	41.7	4.4167	51493
I give ICT course works and tests to check on students masterly of knowledge.	0	0	0	50.0	33.3	2.000	1477710
I always mark and grade	50.0	16.7	16.7	16.7	16.7	2.333	1.66969

Source: Primary data (2022)

Table 4.6 shows lecturers' perceptions on teaching and learning at Makerere University. The results indicate that 66.7% of respondents agreed and 33.3% strongly agreed with the practice of preparing for teaching in advance. The mean score of 4.3333 suggests a generally positive inclination towards pre-semester preparation. The standard deviation of 0.49237 indicates relatively consistent responses, highlighting the importance given to advance preparation before the semester begins.

Regarding the effectiveness of ICT in planning and preparation, as indicated in the second statement, 75.0% of respondents agreed and 25.0% strongly agreed. These results suggested a high level of agreement among participants on the beneficial role of ICT in facilitating effective planning and preparation. The mean score of 4.2500 further emphasized the positive perception of ICT in this aspect. The standard deviation of 0.45227 indicates relatively consistent responses, suggesting a shared understanding of the advantages of using ICT for planning and preparation.

The statement which addresses the practice of giving out course outlines at the beginning of the semester and following them up relative to ICT, received positive responses. The majority of respondents (58.3%) agreed, while 41.7% strongly agreed. These findings highlight the importance of providing course outlines and using ICT to ensure their effective implementation throughout the semester. The mean score of 4.4167 indicates a high level of agreement among participants. The standard deviation of 0.51493 suggests relatively consistent responses, emphasizing the value placed on using ICT for course outline management.

Similarly, the statement, focusing on the development and selection of quality course content using ICT, received positive feedback. The majority of respondents (58.3%) agreed, while 41.7% strongly agreed that ICT enables appropriate development and selection of course content. These results demonstrated a shared belief in the effectiveness of ICT in enhancing the quality of educational materials. The mean score of 4.4167 indicated a high level of agreement, and the standard deviation of 0.51493 suggests relatively consistent responses.

The statement which assessed the perceived increase in interaction and communication on academic matters between students and lecturers using ICT, also received positive responses. The majority of respondents (58.3%) agreed, while 41.7% strongly agreed. These findings suggested that ICT fosters greater interaction and communication between students and lecturers.

The mean score of 4.4167 indicated a high level of agreement, and the standard deviation of 0.51493 suggests relatively consistent responses.

The statement related to assessing student learning, the results revealed mixed opinions regarding the practice of giving ICT coursework and tests. While 50.0% of respondents agreed and 33.3% strongly agreed, indicating a positive perception, there were also respondents (16.7%) who disagreed and strongly disagreed. The mean score of 2.000 suggests a moderate level of agreement. The relatively high standard deviation of 1.477710 indicated a significant variability in responses, reflecting differing views on the efficacy of using ICT coursework and tests for assessing students' mastery of knowledge.

Similarly, the statement, which addressed the practice of marking and grading students using ICT, received mixed responses. While 50.0% of respondents agreed and 16.7% strongly agreed, indicating some level of agreement, there were also respondents (16.7%) who disagreed and strongly disagreed. The mean score of 2.333 suggests a moderate level of agreement, and the standard deviation of 1.66969 indicates significant variability in responses.

In summary, the descriptive information revealed a generally positive perception of ICT in relation to teaching preparation, planning, provision of course outlines, development and selection of course content and fostering interaction and communication. However, the statements regarding assessing student learning through ICT coursework and tests, as well as marking and grading using ICT, received mixed responses, indicating differing viewpoints among respondents.

Table 4.7: Lecturers' perceptions on teaching and learning at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
I prepare for teaching in advance before the semester begins	0	0	0	57.1	42.9	4.4286	.51355
ICT enables lecturers in effective planning and preparation	0	0	0	71.4	28.6	4.2857	.46881
I give out course outlines at the beginning of the semester and follow it up till its covered relative to ICT	0	0	0	57.1	42.9	4.4286	.51355
the quality of course content is developed and selected appropriately using ICT	0	0	0	57.1	42.9	4.3571	.49725
there is increased interaction and communication on academic matters between students and lecturers using ICT	0	0	7.1	57.1	35.7	4.2857	.61125
I give ICT course works and tests to check on students masterly of knowledge.	21.4	28.6	0	14.3	35.7	3.1429	1.70326
I always mark and grade my students using ICT	21.4	21.4	0	28.6	28.6	3.2143	1.62569

Source: Primary data (2022)

Table 4.7 shows lecturers' perceptions on teaching and learning at Kyambogo University.

The Statement "I prepare for teaching in advance before the semester begins", results revealed that a significant majority of respondents (57.1%) agreed, with 42.9% strongly agreed that they prepare for teaching in advance before the semester begins. This suggests a proactive approach to teaching, indicating that educators understand the importance of preparing ahead of time. The high mean score of 4.4286 further indicates a strong consensus among respondents regarding the significance of pre-semester preparation using ICT.

On whether ICT enables lecturers in effective planning and preparation, an overwhelming majority of respondents (71.4%) agreed, with 28.6% strongly agreed that ICT enables lecturers in effective planning and preparation. These findings highlighted the perceived benefits of ICT in facilitating efficient planning and preparation for teaching. The high mean score of 4.2857 suggests a significant level of agreement among respondents, emphasizing the positive impact of ICT on these aspects of the teaching process.

The Statement "I give out course outlines at the beginning of the semester and follow it up till its covered relative to ICT" and majority of respondents (57.1%) agreed, with 42.9% strongly agreeing that they provide course outlines at the beginning of the semester and follow them up relative to ICT. This indicated a commitment to providing students with clear guidelines and ensuring adherence to the outlined course content using ICT. The high mean score of 4.4286 reflects a widespread agreement among respondents, highlighting the importance of course outlines in the teaching process.

The Statement "the quality of course content is developed and selected appropriately using ICT", majority of respondents (57.1%) agreed, with 42.9% strongly agreeing, that it is developed and selected appropriately using ICT. This demonstrated the recognition of ICT's potential in facilitating the creation and selection of high-quality course materials. The mean score of 4.3571 indicated a significant level of agreement among respondents, emphasizing the positive impact of ICT in ensuring appropriate course content development and selection.

The Statement "there is increased interaction and communication on academic matters between students and lecturers using ICT", majority of respondents (57.1%) agreed, while 35.7% strongly agreed, that there is increased interaction and communication on academic matters between students and lecturers using ICT. These findings suggest that ICT plays a crucial role in

fostering communication and engagement in academic settings. Although 7.1% of respondents remained neutral, the high mean score of 4.2857 indicated a general consensus among the majority of participants regarding the positive influence of ICT in facilitating academic interaction and communication.

The Statement "I give ICT course works and tests to check on students' mastery of knowledge" In terms of assessing students' mastery of knowledge, opinions were mixed. While 14.3% of respondents agreed and 35.7% strongly agreed with giving ICT coursework and tests, a significant proportion (21.4%) strongly disagreed, and 28.6% disagreed. This divergence in responses suggested varying perspectives on the effectiveness of using ICT coursework and tests for evaluating students' understanding. The mean score of 3.1429 indicated a moderate level of agreement, and the higher standard deviation of 1.70326 highlights the significant variability in responses.

The Statement "I always mark and grade my students using ICT" yielded mixed opinions. While 28.6% of respondents agreed and 28.6% strongly agreed with this practice, a substantial portion (21.4%) strongly disagreed, and 21.4% disagreed. These results indicated differing viewpoints regarding the effectiveness of ICT in marking and grading. The mean score of 3.2143 suggests a moderate level of agreement, and the standard deviation of 1.62569 implies some variability in responses, emphasizing the diversity of opinions on this matter.

Table 4.8: Students' perceptions on teaching and learning at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
I prepare for ICT lectures in advance before the semester begins	17.7	17.3	19.9	26.5	18.6	3.1106	1.37313
lecturers give out ICT course outlines at the beginning of the semester	9.7	16.8	17.3	37.2	19.0	3.3894	1.24318
lecturers follow the ICT course outline given until all content is covered	18.6	23.5	12.8	25.7	19.7	3.0398	1.42149
students are allowed to consult lecturers via ICT during lectures	13.7	16.8	21.2	23.5	24.8	3.2876	1.36676
lecturers use appropriate ICT teaching methodologies during the lecture	8.9	14.2	16.0	30.2	30.7	3.5956	1.29593
lecturers give us ICT course works and tests to assess our masterly of content	17.3	17.3	16.4	27.2	21.7	3.1903	1.40605
lecturers always mark and grade learners on time and give feedback	9.3	12.4	13.7	34.1	30.5	3.6416	1.28577

Source: Primary data (2022)

To find out whether students were preparing for ICT lectures in advance before the semester begins, the mean score was 3.106 which meant a fair preparation for students to learn via ICT .The responses ranged from 17.7% (Strongly Disagree) to 26.5% (Agree). The majority of respondents (around 18.6%) agreed or strongly agreed while 19.9 % remained undecided with the statement, indicating a positive inclination towards preparing for ICT lectures in advance.

To find out whether there was the distribution of ICT course outlines at the beginning of the semester mean score was 3.389, with a standard deviation of 1.24318 showing that there was a considerable agreement on reception of course outlines at the beginning of the semester. The responses ranged from 9.7% (Strongly Disagree) to 37.2% (Agree). The highest percentage of

respondents (37.2%) agreed with the statement, indicating that most lecturers provide ICT course outlines at the start of the semester.

To find out whether lecturers were following the ICT course outline until all content was covered the mean score was 3.0398, with a standard deviation of 1.42149 indicating a considerable follow up of the course outlines till all content is covered. The responses ranged from 12.8% (Neutral) to 25.7% (Agree). The majority of respondents (around 19.7%) agreed or strongly agreed with the statement, indicating that lecturers tend to follow the course outline to cover all content.

On consulting lecturers via ICT, the mean score was 3.2878 with a standard deviation of 1.36676 indicating a moderate consideration of students allowance to consult during lectures. The responses ranged from 13.7% (Strongly Disagree) to 24.8% (Strongly Agree). The highest percentage of respondents (24.8%) strongly agreed with the statement, indicating that students have the opportunity to consult lecturers through ICT during lectures.

On the use of appropriate ICT teaching methodologies the mean score was 3.595 indicating an average acceptance to the use of appropriate methodologies .The responses ranged from 8.9% (Strongly Disagree) to 30.7% (Strongly Agree). The highest percentage of respondents (30.7%) strongly agreed with the statement, indicating that lecturers commonly utilize appropriate ICT teaching methodologies.

On whether lecturers were giving ICT coursework and tests to assess the students' mastery of content the mean score for was 3.190321 hence a moderate acknowledgment of reception of course works and tests. The responses ranged from 16.4% (Neutral) to 27.2% (Agree). The majority of respondents (around 21.7%) agreed or strongly agreed with the statement, indicating that lecturers provide coursework and tests for assessment purposes.

Regarding marking and grading timelines the mean score for was 3.6416 hence a moderate consideration for lecturers marking and grading learners on time and giving feedback. The responses range from 9.3% (Strongly Disagree) to 34.1% (Agree). The highest percentage of respondents (34.1%) was in agreement with the statement, indicating that lecturers generally mark and grade learners on time and provide feedback.

These explanations provide insights into the distribution of responses, the central tendency represented by the mean, and the spread of responses indicated by the standard deviation for each participant's perceptions.

Table 4.9: Students' perceptions on teaching and learning at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
I prepare for ICT lectures in advance before the semester begins	5.3	21.8	11.3	28.6	33.1	3.6241	1.28865
lecturers give out ICT course outlines at the beginning of the semester	25.6	29.3	13.5	19.5	12.0	2.6316	1.36778
lecturers follow the ICT course outline given until all content is covered	9.0	30.8	14.3	21.8	24.1	3.2105	1.34870
students are allowed to consult lecturers via ICT during lectures	14.3	29.3	12.8	29.3	14.3	3.0000	1.32001
lecturers use appropriate ICT teaching methodologies during the lecture	15.8	35.3	16.5	18.0	14.3	2.7970	1.30709
lecturers give us ICT course works and tests to assess our masterly of content	10.5	21.8	2.3	29.3	36.1	3.5865	1.43087
lecturers always mark and grade learners on time and give feedback	12.0	18.8	18.8	30.1	20.3	3.2782	1.31052

Source: Primary data (2022)

To find out whether students prepare for ICT lectures in advance before the semester begins, on average, respondents scored a mean of 3.62 with a standard deviation of 1.29 thus a moderate concurrence with the statement. The responses ranged from 5.3% (Strongly Disagree) to 33.1% (Strongly Agree). The majority of respondents around 33.1% strongly agreed with the statement, indicating a high inclination towards preparing for ICT lectures in advance.

To find out whether there was course outlines distribution at the beginning of the semester the mean score for the distribution was 2.63, with a standard deviation of 1.37 indicating a low concurrence with the statement. The responses ranged from 25.6% (Strongly Disagree) to 19.5% (Agree). The highest percentage of respondents (29.3%) disagreed with the statement, suggesting that the distribution of course outlines could be improved.

To find out whether following the course outline was appreciated by lecturers until all content is covered respondents had an average score of 3.21 (mean) with a standard deviation of 1.35 which meant a moderate concurrence to the statement. The responses ranged from 9.0% (Strongly Disagree) to 24.1% (Strongly Agree). The majority of respondents (around 24.1%) strongly agreed, indicating that lecturers tend to follow the course outline.

To find out whether students were being allowed to consult lecturers via ICT during lectures .On average, respondents scored 3.00 (mean) with a standard deviation of 1.32 hence indicating a moderate concurrence with the statement. The responses ranged from 14.3% (Strongly Disagree) to 29.3% (Agree). The highest percentage of respondents (29.3%) agreed with the statement, suggesting that students have the opportunity to consult lecturers through ICT during lectures.

To find out whether there was use of appropriate ICT teaching methodologies the mean score was 2.80, with a standard deviation of 1.31 which indicated a low concurrence with the

statement. The responses ranged from 15.8% (Strongly Disagree) to 18.0% (Agree). The highest percentage of respondents (35.3%) disagreed with the statement, indicating room for improvement in using appropriate teaching methodologies.

To find out whether lecturers were giving ICT coursework and tests to assess the students' mastery of content respondents had an average score of 3.59 (mean) with a standard deviation of 1.43. The responses ranged from 10.5% (Strongly Disagree) to 36.1% (Strongly Agree). The majority of respondents (around 36.1%) strongly agreed, indicating that lecturers provide coursework and tests for assessment purposes.

To find out whether lecturers always marked and graded learners on time and giving feedback on average, respondents scored 3.28 (mean) with a standard deviation of 1.31 indicating a moderate concurrence with the statement. The responses ranged from 12.0% (Strongly Disagree) to 30.1% (Agree). The highest percentage of respondents (30.1%) agreed, indicating that lecturers generally mark and grade learners on time and provide feedback.

4.4.2 Relationship between ICT Literacy and Teaching and Learning. The first objective of the study was to determine the relationship between the level of ICT literacy and teaching and learning efficiency at Kyambogo and Makerere Universities. The level of ICT literacy was measured using a five point Likert scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree. A mean score result below the threshold of 3 suggests a disagreement while a mean score result greater than the threshold of 3 suggests an agreement by most of the respondents on a particular statement of the variable.

Table 4.10:   Students' Perceptions on the Level of ICT Literacy at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university has trained students and lecturers on how to use zoom and reskilled on how to use some other facilities	12.3	10.0	27.7	31.5	18.5	3.34	1.242
The lecturers and students know how to use Google meet during teaching and learning	5.4	21.5	1.5	38.5	33.1	3.72	1.275
The university has created a Moodle platform which is used by all lecturers and students	3.8	13.1	34.6	32.3	25.4	3.43	1.034
The students and lecturers can ably use more of social media during teaching and learning	7.7	25.4	9.2	32.3	25.4	3.42	1.316
The students and lecturers use video conferencing during teaching and learning	30.0	28.5	11.5	20.8	9.2	2.50	1.354

Source: Primary data (2022)

The findings in Table 4.10 revealed that the university had trained students and lecturers on how to use zoom since the majority of the respondents (50%) were in agreement with the statement as indicated by a mean score of 3.34 above the threshold of 3 and a standard deviation of 1.242. This implies that the lecturers and students are literate and can conveniently use zoom during the teaching learning process.

On whether the lecturers and students know how to use Google meet during teaching and learning, the results revealed that the lecturers and students knew how to use Google meet during teaching and learning since majority of the respondents (71.6%) supported the statement with a mean score of 3.72 with a standard deviation of 1.275. This implies that the lecturers and

students are literate and can use Google to perform any academic related activities conveniently thus aiding learning.

In relation to existence of a Moodle platform used at the university, the study revealed that the university had created a Moodle platform; Kyambogo electronic learning management system (KELMS) which is used by all lecturers and students during teaching and learning since a bigger proportion of the respondents (57.7%) were in agreement to the statement as indicated by a mean score of 3.43 above the threshold of 3 and a standard deviation of 1.034. This means that students are literate on the usage and can easily access the course materials and their performance grades via the Moodle which eases the learning process likewise the lecturers share the instructional materials easily with the students hence exhibiting literacy.

On the issue about the ability to use more of social media during teaching and learning, the study revealed that the students and lecturers can ably use more of social media during teaching and learning since a bigger proportion of respondents (57.7%) were in agreement with the statement and this was indicated by a mean score of 3.42 which is above the threshold of 3 and a standard deviation of 1.316. Therefore, communication becomes easier bridging the gap between the students and lecturers while in and out of campus hence a high level of literacy.

The study also sought to establish whether respondents use video conferencing during teaching and learning. The study findings reveal that most of the students and lecturers did not use video conferencing during teaching and learning since most of the respondents (70.0%) were in disagreement to the statement with a mean score of 2.50 below the threshold of 3 with a standard deviation of 1.354. This therefore, increases physical meeting, physical interaction and teaching implying low levels of literacy in the usage of video conferencing since the respondents associated it with being ineffective hence detested in the process of teaching and learning.

Table 4.11: Lecturers' Perceptions on the Level of ICT Literacy at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
I can ably use zoom to teach	0	0	0	57.1	42.9	5.1429	2.59755
I know how to use Google meet to teach	0	0	0	57.1	42.9	4.4286	.51355
I prefer using the university's Moodle platform to teach	0	0	0	35.7	64.3	4.6429	.49725
I know how to conduct lectures through social media	0	0	0	42.9	57.1	4.5714	.51355
I have been advised to use video conferencing to teach	0	0	0	28.6	71.4	4.7143	.46881

Source: Primary data (2022)

The findings in Table 4.11 revealed that the respondents demonstrate a high level of confidence in using Zoom for teaching purposes, with 57.1% strongly agreeing and 42.9% agreeing. This indicates that the majority of respondents feel capable and competent in utilizing Zoom effectively. The mean score of 5.1429 further supports their self-assurance in using Zoom. However, there was some variability in their responses, as indicated by the standard deviation of 2.59755.

Similarly, respondents expressed confidence in their ability to use Google Meet for teaching, with 57.1% strongly agreeing and 42.9% agreeing. This demonstrates a widespread familiarity and expertise in utilizing Google Meet's features and functions. The mean score of 4.4286 aligned with their confidence in using Google Meet effectively. The standard deviation of 0.51355 suggests relatively low variability in their responses.

For the statement about preferring to use the university's Moodle platform for teaching, respondents overwhelmingly expressed a preference, with 35.7% agreeing and 64.3% strongly

agreeing. This highlighted a strong inclination towards utilizing the university's Moodle platform. The mean score of 4.6429 further reinforced their preference, suggesting a high level of satisfaction with the platform. The standard deviation of 0.49725 indicates relatively low variability in their responses.

Respondents also indicated familiarity with conducting lectures through social media platforms, with 42.9% agreeing and 57.1% strongly agreeing. This demonstrates a high level of literacy and comfort in utilizing social media platforms for teaching purposes. The mean score of 4.5714 supports this perception, indicating a positive perception of utilizing social media for conducting lectures. The standard deviation of 0.51355 suggested relatively low variability in their responses.

Moreover, respondents reported receiving advice to use video conferencing for teaching purposes, with 28.6% agreeing and 71.4% strongly agreeing. This suggested a strong endorsement and recognition of the value of video conferencing in teaching. The mean score of 4.7143 further supports this positive perception, highlighting the importance of video conferencing tools. The standard deviation of 0.46881 indicates relatively low variability in their responses.

In summary, the descriptive statistics revealed that respondents feel confident in using Zoom and Google Meet for teaching purposes. They also expressed a strong preference for the university's Moodle platform and demonstrate knowledge of conducting lectures through social media platforms. Additionally, respondents indicated receiving advice to use video conferencing tools for teaching. These findings collectively underscore the positive disposition and knowledge of lecturers towards utilizing various digital tools and platforms in their teaching practices.

Table 4.12: Students' Perceptions on the Level of ICT Literacy at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university has trained students and lecturers on how to use zoom and reskilled on how to use some other facilities	12.3	10.0	27.7	31.5	18.5	3.34	1.242
The lecturers and students know how to use Google meet during teaching and learning	5.4	21.5	1.5	38.5	33.1	3.72	1.275
The university has created a Moodle platform which is used by all lecturers and students	3.8	13.1	34.6	32.3	25.4	3.43	1.034
The students and lecturers can ably use more of social media during teaching and learning	7.7	25.4	9.2	32.3	25.4	3.42	1.316
The students and lecturers use video conferencing during teaching and learning	30.0	28.5	11.5	20.8	9.2	2.50	1.354

Source: Primary data (2022)

The study investigated whether Makerere University had trained students on how to use zoom. The findings in Table 4.12 revealed that the university had trained students and lecturers on how to use zoom since the majority of the respondents (58.4%) were in agreement with the statement as indicated by a mean score of 3.123 above the threshold of 3 and a standard deviation of 1.491. This implies that the lecturers and students are literate and can conveniently use zoom during the teaching learning process.

On whether the lecturers and students know how to use Google meet during teaching and learning, the results revealed that the lecturers and students knew how to use Google meet during teaching and learning since majority of the respondents (68.6%) supported the statement with a

mean score of 3.726 with a standard deviation of 1.245. This implies that the lecturers and students are literate use Google to perform any academic related activities conveniently thus aiding learning.

In relation to existence of a Moodle platform used at the university, the study revealed that the university had created a Moodle platform; Makerere university electronic learning environment (MUELE) which is used by all lecturers and students during teaching and learning since a bigger proportion of the respondents (65.1%) were in agreement to the statement as indicated by a mean score of 3.717 above the threshold of 3 and a standard deviation of 1.333. This means that students can easily access the course materials and their performance grades via the Moodle which eases the learning process. The lecturers also share the instructional materials easily with the students hence literate.

On the issue about the ability to use more of social media during teaching and learning, the study revealed that the students and lecturers can ably use more of social media during teaching and learning since a bigger proportion of respondents (63.3%) were in agreement with the statement and this was indicated by a mean score of 3.579 which is above the threshold of 3 and a standard deviation of 1.235. Therefore, communication becomes easier bridging the gap between the students and lecturers while in and out of campus.

The study also sought to establish whether respondents use video conferencing during teaching and learning. The study findings reveal that most of the students and lecturers did not use video conferencing during teaching and learning since most of the respondents (54.0%) were in disagreement to the statement with a mean score of 3.1416 above the threshold of 3 with a standard deviation of 1.365. This therefore, implies a moderate literacy level as some respondents accepted knowing how to use but uninterested in using the feature.

Table 4.13: Lecturers' Perceptions on the Level of ICT Literacy at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
I can ably use zoom to teach	0	0	0	58.3	33.3	5.1667	2.82307
I know how to use Google meet to teach	0	0	0	66.7	33.3	4.3333	.49237
I prefer using the university's Moodle platform to teach	0	0	0	33.3	66.7	4.6667	.49237
I know how to conduct lectures through social media	0	0	0	58.3	41.7	4.4167	.51493
I have been advised to use video conferencing to teach	0	0	0	16.7	83.3	4.8333	.38925

Source: Primary data (2022)

The findings in Table 4.13 revealed that a significant majority of respondents (58.3% strongly agree, 33.3% agree) expressed confidence in their ability to effectively use Zoom for teaching purposes. This demonstrated a high level of proficiency and suggests that the respondents are comfortable with utilizing Zoom's features and functionalities. The mean score of 5.1667 further supports their self-assurance in using Zoom.

Similarly, a majority of respondents (66.7% strongly agree, 33.3% agree) indicated that they possess the necessary knowledge to use Google Meet for teaching. This demonstrated a high level of familiarity and expertise in utilizing Google Meet's features and functions. The mean score of 4.3333 aligns with their confidence in using Google Meet effectively.

Respondents overwhelmingly prefer using the university's Moodle platform for teaching, with 66.7% strongly agreeing and 33.3% agreeing. This indicated a strong preference for the platform's capabilities and resources. The mean score of 4.6667 further reinforces their inclination towards utilizing the university's Moodle platform for teaching purposes.

In terms of conducting lectures through social media, a majority of respondents (41.7% strongly agree, 58.3% agree) expressed their competence in this area. They possessed the necessary knowledge and skills to leverage social media platforms effectively for teaching purposes. The mean score of 4.4167 supports their confidence in utilizing social media platforms for delivering lectures.

Furthermore, respondents received advice to use video conferencing for teaching purposes, with 83.3% strongly agreeing and 16.7% agreeing. This highlighted the importance placed on video conferencing tools as an effective means of teaching. The mean score of 4.8333 underscores the strong endorsement for using video conferencing tools based on the advice received.

In summary, the descriptive statistics demonstrate that respondents possessed a high level of proficiency in using various digital tools for teaching. They exhibited confidence in platforms such as Zoom and Google Meet, express a preference for the university's Moodle platform, and demonstrated knowledge in conducting lectures through social media. Moreover, respondents received advice emphasizing the use of video conferencing tools for teaching purposes. These findings collectively highlight the positive disposition of respondents towards integrating digital technologies into their teaching practices.

In relation to ICT literacy, some of the Key Informants had this to say;

> A number of ICT platforms have been developed and used by students and lecturers such as MUELE, Zoom and Google classroom which are used inter-changeably and these to a greater extent have enabled interactive learning, shortened distance, and enabled us carry out assessment electronically both

continuous and summative assessment. *(Respondent 05 from Makerere University).*

This implies that teaching and learning process is more convenient and can accommodate a relatively large number of students per session.

There are Moodle platform that are developed by the ICT department which are used in the assessment of learners and giving feedback by lecturers which makes the teaching learning process very easy... (Respondent 04 from Kyambogo University).

This means that assessment is instant, unbiased and trusted since it does not involve physical interaction and encountering. The students easily trust their scores since they are system based and uniformly set across the entire group of the class.

There is inadequacy in knowledge to operate the KELMS platform by both students and lecturers but however, some training has been provided to facilitate both students and lecturers on how to use KELMS platform but it has been massively insufficient…… (Respondent 03 from Kyambogo University).

Therefore, the operation of these systems remain at the mercy of how advanced the lecturer is in relation to operation of the programs. Some students too may fail to access particular materials since their system knowledge is inadequate.

Training has been provided to lecturers and students on how to use Zoom and Google meet during the teaching and learning process which has eased learning and therefore a bigger number of students and lecturers can ably use Zoom and Google meet platforms during learning process… (Respondent 01 from Kyambogo University).

The researcher observed that this training was not sufficient. The lecturers were too busy to learn and others seemed too rigid to adapt to the new trends of technology. As for the students, they lacked necessary gadgets to access some of the platforms since they required strong storage and heavy duty machines.

Therefore, the aim of training both lecturers and students to effectively operate using ICT is to achieve effective the positives embedded in ICT on teaching and learning thus the ability to operate via the various is an indicator that teaching and learning takes place in the institution since then study materials can be shared amongst the lecturers and students to achieve effective teaching and learning.

The thematic analysis reveals several key themes regarding ICT literacy in the teaching and learning process. Firstly, the use of various ICT platforms such as MUELE, Zoom, and Google Classroom is highlighted. These platforms enable interactive learning, shorten distances, and facilitate electronic assessments, leading to greater convenience and the ability to accommodate a larger number of students per session. Secondly, the use of Moodle platforms for assessment and feedback is mentioned, emphasizing the advantages of instant, unbiased, and trusted assessments that are uniformly set across the entire class.

However, a theme of inadequate knowledge to operate certain platforms, like KELMS and MUELE, is observed. Although some training has been provided, it is deemed massively insufficient. The effectiveness of these systems relies heavily on the expertise of the lecturers, and students may face difficulties accessing materials due to insufficient system knowledge. Thirdly, training has been provided on platforms like Zoom and Google Meet, enhancing the learning process. However, the training is noted as insufficient, with lecturers too busy or resistant to adapting to new technological trends, and some students lacking necessary gadgets

for accessing certain platforms. The overarching aim of training is to effectively operate using ICT tools to leverage their positive impacts on teaching and learning. This enables the sharing of study materials among lecturers and students, ultimately fostering effective teaching and learning experiences.

Table 4.14: Correlation Analysis between ICT Literacy and Teaching and Learning at Kyambogo and Makerere Universities

Makerere University		ICT Literacy	Teaching and Learning
ICT Literacy	Spearman's Correlation Coefficient	1.000	.396[**]
	Sig. (2-tailed)	.	.000
	N	239	239
Teaching and Learning	Spearman's Correlation Coefficient	.396[**]	1.000
	Sig. (2-tailed)	.000	.
	N	239	239
Kyambogo University		ICT Literacy	Teaching and Learning
ICT Literacy	Spearman's Correlation Coefficient	1.000	.430[**]
	Sig. (2-tailed)	.	.000
	N	147	147
Teaching and Learning	Spearman's Correlation Coefficient	.430[**]	1.000
	Sig. (2-tailed)	.000	.
	N	147	147
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Primary data (2022)

The study employed Spearman's rank correlation analysis to examine whether there exists a statistically significant relationship between the level of ICT literacy and teaching and learning at Makerere University. The correlation results in Table 4.14 revealed that the level of ICT literacy has a weak positive and statistically significant relationship with teaching and learning at Makerere university (r = 0.396, P-value=0.00<0.01). The results imply that an improvement in the level of ICT literacy slightly but significantly improves on the teaching and learning efficiency at Makerere university (39.6% only). The remaining 60.4% can be caused by other factors rather than ICT. Therefore, ICT literacy, however important it is, cannot explain everything by itself. It implies thus that access to ICT devices; electric connections are other factors that could facilitate the use of ICT.

For Kyambogo University, the study employed Spearman's rank correlation analysis to examine whether there exists a statistically significant relationship between the level of ICT literacy and teaching and learning at Kyambogo University. The correlation results in Table 4.7 revealed that there is a weak positive and statistically significant relationship between the level of ICT literacy and teaching and learning at Kyambogo university (r = 0.430, P-value = 0.00 < 0.01). The results imply that an improvement in the level of ICT literacy slightly but significantly leads to an improvement in the teaching and learning at Kyambogo university which means that the university has to adopt to the necessary changes so as to be in the modern trend of technology.

Table 4.15: T-test Analysis on level of ICT Literacy on Teaching and Learning between Kyambogo and Makerere Universities

	INSTITUTION	N	Mean	Std. Deviation	Std Error Mean
ICT LITERACY	Kyambogo	133	3.0912	.67650	.05866
	Makerere	227	3.4334	.91064	.06044

Independent Sample Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ICT LITERACY	Equal variances assumed	12.904	.000	-3.767	358	.000	-.34220	.09085	-.52088	-.16353
	Equal variances not assumed			-4.063	338.329	.000	-.34220	.08423	-.50788	-.17653

Source: Primary data (2022)

The independent samples t-test was conducted to compare the ICT literacy levels between Kyambogo and Makerere universities. The analysis revealed a significant difference in ICT

literacy scores between the two institutions. Kyambogo university had an ICT literacy score of (mean = 3.0912, SD = 0.67650), while Makerere university had a higher score of (Mean = 3.4334, SD = 0.91064). The t-test, assuming equal variances, showed a significant negative mean difference of (mean =-0.34220, P = 0.000 < 0.005), indicating that Kyambogo university had a significantly lower ICT literacy level compared to Makerere university. This finding was further supported by the t-test that accounted for unequal variances, with a similar negative mean difference and a significant p-value (P= 0.000<0.005). Therefore, Makerere University demonstrated a higher level of ICT literacy effect on teaching and learning compared to Kyambogo University, as supported by both statistical tests.

4.4.3 ICT Connectivity and Teaching and Learning. The second objective of the study was to find out the effect of ICT connectivity on teaching and learning at Kyambogo and Makerere Universities. The ICT Connectivity was measured using a five point Likert scale ranging from 1= Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree. A mean score result below the threshold of 3 suggests a disagreement while a mean score result greater than or equal to the threshold of 3 suggests an agreement by most of the respondents on a particular statement of the variable.

Table 4.16: Students' Perception about ICT Connectivity at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university internet speed is fast	13.1	33.8	11.5	21.5	20.0	3.015	1.375
There are intranet connections provided in this university	16.9	33.8	10.8	26.9	11.5	2.823	1.314
Students and lecturers can access internet everywhere in the university	16.9	36.9	18.5	16.9	10.8	2.677	1.246
The university has provided free data to facilitate the teaching and learning process	7.7	17.7	4.6	33.8	36.2	3.730	1.322
There is free wireless internet connection in this university	25.4	32.3	14.6	17.7	10.0	2.546	1.312

Source: Primary data (2022)

The study established the respondents' perceptions about ICT connectivity at Kyambogo and the findings are presented in Table 4.16.

In relation to internet speed, the study results revealed that Kyambogo university internet speed is not fast since a bigger proportion of respondents (58.5%) were in disagreement to the statement indicated with a mean score of 3.015 above the threshold of 3 with a standard deviation of 1.375. This means that students and lecturers find a hurdle with the internet services to make the work easier and reliable. However, 41.5% agreed that the internet speed was fast if accessed from certain points in the university.

The study established whether there are intranet connections provided in the university. The findings revealed that a smaller proportion of respondents (38.4%) were in agreement to the statement that there are intranet connections provided in this university while 50.7% disagreed and this was also indicated by a mean score of 2.823 below the threshold of 3 with a standard

deviation of 1.314. This implies that there is a difficulty in intranet supports of other connections and operation of devices which affects keeping the systems in operation to boost the zeal of the students and lecturers to rely on the connectivity.

The study sought to establish whether students and lecturers can access internet everywhere in the university. The study findings revealed that students and lecturers cannot access internet everywhere in the university since majority of the respondents (72.3%) were in disagreement to the statement as indicated by a mean score of 2.677 with a standard deviation of 1.256. This implies that some lecture rooms, hot spot areas and offices are not served with internet hence the users have to incur extra costs of purchasing data bundles so as to access online services. However, the university does not cater for the extra internet charges for students and lecturer which demotivates them thus abandoning their usage.

The respondents were asked whether the university has provided free data to facilitate the teaching process. The study results show that the university has not provided free data to facilitate the teaching and learning process since some respondents (30.4%) were in disagreement to the statement and this was supported by a mean score of 3.730 above the threshold of 3 with a standard deviation of1.322. There are other internet connections for both students and lecturers that are accessible through different procedures which means that students and lecturers make some sacrifice to buy bundles so as to back up on the provided network just in case they cannot access what was provided.

The study established whether there is free wireless internet connection in the university. The study revealed that majority of the respondents (72.3%) were in disagreement to the statement that there is free wireless internet connection in this university and this was indicated by a mean score of 2.546 below the threshold of 3 and a standard deviation of 1.312.the

27.7% who agreed to the statement confirmed that the Wi-Fi was not strong enough especially when majority of the students were on-campus and in common hotspot areas but was present if one positioned themselves well.

Table 4.17: Lecturers' Perception about ICT Connectivity at Kyambogo University

	SD	D	N	A	SA	Mean	Std.
	Percentages						deviation
I can ably use zoom to teach	0	0	0	57.1	42.9	5.1429	2.59755
I know how to use Google meet to teach	0	0	0	57.1	42.9	4.4286	.51355
I prefer using the university's Moodle platform to teach	0	0	0	35.7	64.3	4.6429	.49725
I know how to conduct lectures through social media	0	0	0	42.9	57.1	4.5714	.51355
I have been advised to use video conferencing to teach	0	0	0	28.6	71.4	4.7143	.46881

Source: Primary data (2022)

The study established the lecturers' perceptions about ICT connectivity at Kyambogo and the findings are presented in Table 4.17.

Respondents had mixed opinions regarding the internet speed at the university. With 42.9% strongly disagreeing and 35.7% disagreeing that the university's internet speed is fast, 21.4% were neutral, and 21.4% agree. The mean score of 2.0000 suggested a moderate level of agreement or disagreement among respondents. The standard deviation of 1.17670 indicates some variability in their perceptions.

Regarding the availability of intranet connections in the university, a majority of respondents (71.4%) strongly agreed, 21.4% agreed, and 7.1% were neutral. This demonstrated a consensus among respondents that intranet connections are present within the university. The mean score of 1.4286 further supports this positive perception, suggesting a high level of agreement among respondents. The standard deviation of 0.85163 suggests relatively low variability in their responses.

Similarly, respondents expressed a high level of agreement that lecturers can access the internet everywhere in the university. With 64.3% strongly agreeing (SA), 28.6% agreeing and 7.1% neutral (N), it indicated a widespread perception of lecturers having internet access throughout the university. The mean score of 1.5000 further supported this positive perception, highlighting the availability of internet access for lecturers. The standard deviation of 0.85485 suggested relatively low variability in their responses.

Respondents exhibited varied opinions regarding the university's provision of free data to facilitate the teaching and learning process. While 50.0% strongly disagree, 14.3% disagree, 28.6% are neutral, and 7.1% agree, it suggested differing perspectives on the provision of free data. The mean score of 1.9286 indicated a moderate level of agreement or disagreement among respondents. The standard deviation of 1.07161 suggested some variability in their responses.

In terms of password-free wireless connections in the university, opinions varied among respondents. With 14.3% strongly disagreeing, 28.6% disagreeing, 57.1% agreeing, and 66.7% strongly agreeing, it indicated diverse views on the availability of password-free wireless connections. The mean score of 4.1429 suggested a moderate level of agreement or disagreement among respondents. The standard deviation of 1.40642 suggested some variability in their responses.

In summary, the descriptive statistics indicate mixed opinions among respondents regarding the internet speed at the university. However, there was a consensus that intranet connections are available, and lecturers can access the internet throughout the university. Opinions vary concerning the provision of free data, and there is diversity in views regarding the availability of password-free wireless connections. These findings highlighted the variability in respondents' perceptions regarding specific aspects of internet connectivity and resources within the university.

Table 4.18:   Students' Perception about ICT Connectivity at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university internet speed is fast	13.1	33.8	11.5	21.5	20.0	3.015	1.375
There are intranet connections provided in this university	16.9	33.8	10.8	26.9	11.5	2.823	1.314
Students and lecturers can access internet everywhere in the university	16.9	36.9	18.5	16.9	10.8	2.677	1.246
The university has provided free data to facilitate the teaching and learning process	7.7	17.7	4.6	33.8	36.2	3.730	1.322
There is free wireless internet connection in this university	25.4	32.3	14.6	17.7	10.0	2.546	1.312

Source: Primary data (2022)

In relation to internet speed, the study results revealed that Makerere university internet speed is fast since a bigger proportion of respondents (57.9%) were in agreement to the statement indicated with a mean score of 3.368 above the threshold of 3 with a standard deviation of 1.377. This means that students and lecturers enjoy the internet services to make the work easier and reliable.

The study established whether there were intranet connections provided in the university. The findings revealed that a bigger proportion of respondents (55.2%) were in agreement to the statement that there are intranet connections provided in this university and this was also indicated by a mean score of 3.403 above the threshold of 3 with a standard deviation of 1.310 whereas 44.8% disagreed to the statement. This implies that intranet supports other connections and operation of devices easily and conveniently which helps to keep the systems in operation which boosts the zeal of the students and lecturers to rely on the connectivity.

The study sought to establish whether students and lecturers can access internet everywhere in the university. The study findings revealed that students and lecturers cannot access internet everywhere in the university since majority of the respondents (48.3%) were in disagreement while 51.7 agreed to the statement as indicated by a mean score of 3.314 with a standard deviation of 1.321. This implies that some lecture rooms, hot spot areas and offices are served with internet. Therefore, the users have to incur extra costs of purchasing data bundles so as to access online services if not at the university premises. However, the university does not cater for the extra internet charges for students and lecturer which demotivates them thus abandoning their usage.

The respondents were asked whether the university has provided free data to facilitate the teaching and learning process. The study results show that the university has not provided free data to facilitate the learning process since majority of the respondents (30.5%) were in disagreement to the statement and this was supported by a mean score of 3.819 above the threshold of 3 with a standard deviation of 1.329. This means that students must sacrifice to buy bundles so as to back up on the provided network as the data has only been provided to lecturers.

The study established whether there is free wireless internet connection in the university. The study revealed that majority of the respondents (54.9%) were in agreement to the statement that there is free wireless internet connection in this university and this was indicated by a mean score of 3.354 above the threshold of 3 and a standard deviation of 1.285. However, the researcher noted that the Wi-Fi was not strong enough especially when it was overcrowded.

Table 4.19: Lecturers' Perception about ICT Connectivity at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university's internet speed is fast	8.3	41.7	8.3	4.7	0	2.8333	1.11464
There are intranet connections in the university	66.7	33.3	0	0	0	1.3333	.49237
Lecturers can access internet everywhere in the university	66.7	33.3	0	0	0	1.3333	.49237
The university has provided free data to lecturers to facilitate the teaching and learning process	16.7	33.3	33.3	8.3	8.4	2.5000	1.00000
There password free wireless connection in the university	0	0	8.3	33.3	58.3	4.5000	.67420

Source: Primary data (2022)

Results in Table 4.19 reveal that respondents had mixed opinions about the internet speed at the university. While 8.3% strongly disagreed and 41.7% disagreed with the statement that the university's internet speed is fast, 8.3% are neutral and 4.7% agreed. The mean score of 2.8333 indicates a relatively moderate agreement level among respondents. The standard deviation of 1.11464 suggests some variability in their perceptions.

In terms of the availability of intranet connections in the university, a majority of respondents (66.7%) strongly agreed and 33.3% agreed. This indicates a consensus among respondents that intranet connections are present within the university. The mean score of 1.3333 further supports this positive perception, suggesting that the majority of respondents believe intranet connections are accessible.

Similarly, respondents believed that lecturers can access the internet everywhere in the university. With 66.7% strongly agreeing and 33.3% agreeing, it demonstrates a high level of consensus among respondents. The mean score of 1.3333 further supports this perception, indicating that the majority of respondents believe in widespread internet access for lecturers throughout the university.

Regarding the provision of free data to facilitate the teaching and learning process, respondents' opinions varied. While 16.7% strongly disagreed and 33.3% disagreed, an equal percentage of respondents (33.3%) were neutral, 8.3% agreed and 8.4% strongly agreed. The mean score of 2.5000 suggests a relatively moderate level of agreement or disagreement among respondents. The standard deviation of 1.00000 indicates some variability in their perceptions.

In terms of password-free wireless connections in the university, 8.3% strongly disagreed, 33.3% disagreed, 58.3% strongly agreed, and 4.5% agreed. This indicates a strong consensus among respondents that the university offers password-free wireless connections. The mean score of 4.5000 further supports this positive perception, suggesting that the majority of respondents believe in the availability of password-free wireless connections.

In summary, the descriptive statistics revealed mixed opinions regarding the university's internet speed, with respondents expressing a range of agreement levels. However, there was a consensus among respondents that intranet connections are available and that lecturers can

access the internet throughout the university. The provision of free data to facilitate the teaching and learning process elicited varying responses. On the other hand, there was a strong consensus that the university offers password-free wireless connections. These findings demonstrated the variability in respondents' perceptions regarding aspects of internet availability and connectivity within the university.

In relation to ICT connectivity, some of the Key Informants mentioned that;

> Internet connectivity is irregular, it is sometimes on and the other times very slow so one can purchase their own data and use alongside the university's to be very secure... (Respondent 003, Makerere).

Therefore, this situation affects the reliability and dependability to run online sessions since they need constant and stable internet connectivity.

> There are some Wi-Fi connects at the university campus which are password free for students at the colleges and also lecturers are provided with passwords to access the staff Wi-Fi network portals. (Respondent 01 from Makerere University).

Though this is the case, this Wi-Fi is sometimes weak especially when over loaded by the users. This affects the connectivity thus interrupting the flow of the lesson or discussion and even opening the MOODLE.

> Students can access the password free Wi-Fi from university depending on the area they are since different faculties have different Wi-Fi connections so the nearer to one server at the faculty the stronger the connection though it gets weaker with distance… (Respondent 01 from Kyambogo University).

Though this is the case, this Wi-Fi is sometimes weak especially when over loaded by the users. This affects the connectivity thus interrupting the flow of the lesson or discussion and even opening the MOODLE.

In case of inability and failure to access university Wi-Fi both students and lecturers procure personal data so as to engage in the teaching and learning process and access the internet. (Respondent 05 from Kyambogo University).

This however comes with a cost which some students may not afford thus missing out on important elements presented online. Some lecturers also complained about expensive packages of bundles in relation to the usage. Some of the bundles are swiftly used due to the heaviness of the systems being operated.

The thematic analysis highlights several key themes related to ICT connectivity in the educational context. Irregular and unreliable internet connectivity emerges as a significant challenge, with intermittent access and slow speeds. This inconsistency negatively impacts the reliability and dependability of online sessions, necessitating the purchase of personal data to ensure a secure and stable connection. The presence of university Wi-Fi networks is noted, with password-free access for students and password-protected access for lecturers.

However, the Wi-Fi quality is often compromised when it becomes overloaded, leading to disruptions in lessons, discussions, and accessing platforms like Moodle. Additionally, the variability of Wi-Fi strength within the campus is acknowledged, with better connectivity closer to faculty servers but weaker signals at a distance. In light of these challenges, students and lecturers resort to procuring personal data to engage in teaching and learning activities, but the cost can be a barrier for some students, resulting in missed opportunities. Expensive data packages and the heavy data usage associated with operating ICT systems also present additional

hurdles for lecturers. These themes collectively underscore the limitations, financial implications, and the need for improved stability and accessibility of ICT connectivity in the educational context thus speaking back to the quantitative results.

Table 4.20: Regression findings on the Effect of ICT Connectivity on Teaching and Learning at Kyambogo and Makerere Universities

Model Summary (Makerere University)					
Model	R	R Square		Adjusted R Square	Std. Error of the Estimate
1	.543[a]	.295		.292	.41979
a. Predictors: (Constant), ICT Connectivity					
Coefficients[a]					
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.775	.115		15.465	.000
	ICT Connectivity	.379	.038	.543	9.952	.000
Model Summary (Kyambogo University)					
Model	R	R Square		Adjusted R Square	Std. Error of the Estimate
1	.703[a]	.494		.491	.41814
a. Predictors: (Constant), ICT Connectivity					
Coefficients[a]					
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.458	.162		9.009	.000
	ICT Connectivity	.507	.043	.703	11.907	.000
a. Dependent Variable: Teaching and Learning					

Source: Primary data (2022)

To establish whether ICT connectivity has a statistically significant effect on teaching and learning at Makerere University, the researcher conducted a simple linear regression analysis and

the results are presented in Table 4.20. The results indicate that ICT connectivity has a moderate and statistically significant effect on teaching and learning at Makerere university (β=0.543, P-value=0.00<0.05). The regression findings indicate that a unit increase in ICT connectivity results into an improvement in teaching and learning at Makerere University by 54.3%. The results imply that as ICT connectivity increases, it results into an improvement in teaching and learning at Makerere University.

The model summary results indicate that the coefficient of determination (Adjusted R-square) was 0.292, which indicates that ICT connectivity explains 29.2% of the total variations in the teaching and learning efficiency at Makerere University and the remaining 70.8% of the total variations are explained by other factors. This implies that ICT connectivity slightly and significantly affects teaching and learning at Makerere University.

To establish whether ICT connectivity has a statistically significant effect on teaching and learning at Kyambogo University, the researcher conducted a simple linear regression analysis and the results are presented in Table 4.20. The results indicate that ICT connectivity has a strong positive and statistically significant effect on teaching and learning at Kyambogo university (B=0.703, P-value<0.05). The regression findings indicate that a unit increase in ICT connectivity results into an improvement in teaching and learning at the universities by 70.3%. The results imply that as ICT connectivity increases, it results into an improvement in teaching and learning at Kyambogo University.

The model summary results indicate that the coefficient of determination (Adjusted R-square) was 0.491, which indicates that ICT connectivity explains 49.1% of the total variations in the teaching and learning efficiency at Kyambogo University and the remaining 50.9% of the

total variations are explained by other factors. This implies that ICT connectivity slightly and significantly affects teaching and learning at Kyambogo University.

The difference (Makerere moderate and Kyambogo strong relationship) means that the lecturers and students of Kyambogo accessed more ICT connectivity compared to their counterparts of Makerere University.

Table 4.21:   T-test findings on the Effect of ICT Connectivity on Teaching and Learning at Kyambogo and Makerere Universities

	INSTITUTION	N	Mean	Std. Deviation	Std Error Mean
ICT CONNECTIVITY	Kyambogo	133	2.8179	.74225	.06436
	Makerere	227	3.2991	.93409	.06200

Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
									Lower	Upper
ICT CONNECTIVITY	Equal variances assumed	5.522	.019	-5.075	358	.000	-.48119	.09482	-.66766	-.29472
	Equal variances not assumed			-5.385	326.450	.000	-.48119	.08937	-.65700	-.30539

Source: Primary data (2022)

The independent samples t-test was conducted to compare the effect of ICT connectivity on teaching and learning between Kyambogo and Makerere universities. The analysis revealed a significant difference in the effect of ICT connectivity and teaching and learning between the two universities. Kyambogo university had a lower mean (mean = 2.8179, SD = 0.74225), while Makerere university had a higher mean of (mean = 3.2991, SD = 0.93409).Both means were moderate meaning that there was a moderate effect of ICT connectivity and teaching and learning at both Kyambogo and Makerere universities. The t-test assuming equal variances showed a significant negative mean difference of (mean=-0.48119, P = 0.000<0.005), indicating that Kyambogo university had a significantly lower ICT connectivity effect on teaching and learning compared to Makerere university. This finding was further supported by the t-test that accounted for unequal variances, with a similar negative mean difference and a significant p-value (P = 0.000<0.005). Therefore Makerere University demonstrated a higher effect of ICT connectivity on teaching and learning compared to Kyambogo University, as supported by both statistical tests.

4.4.4 ICT Infrastructure and Teaching and Learning. The third objective of the study was to establish the relevancy of ICT infrastructure on teaching and learning at Kyambogo and Makerere Universities. ICT Infrastructure was measured using a five point Likert scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree. A mean score value below the threshold of 3 suggests a disagreement while a mean score value greater than or equal to the threshold of 3 suggests an agreement by most of the respondents on a particular statement of the variable.

Table 4.22: Students Perceptions on ICT Infrastructure at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university has computer laboratories	13.8	34.6	13.1	26.2	12.3	2.555	1.286
The university has laboratories equipped with enough computers for lecturers and students	14.6	33.8	13.8	29.2	8.5	2.531	1.239
Most students can afford to have smartphones connected to internet in this university	37.7	34.6	12.3	9.2	6.2	2.115	1.919
The university has a steady power supply in computer laboratory	36.2	20.8	4.6	19.2	19.2	2.646	1.5841
There are supporting staff in the computer laboratory that provide assistance during teaching and learning process	13.1	20.0	20.0	30.0	16.9	3.177	1.2968

Source: Primary data (2022)

The study sought to establish the respondents' perceptions in regards to ICT infrastructure at Kyambogo and Makerere universities and the results are presented in Table 4.22.

The findings reveal that Kyambogo university hasn't enough computer laboratories since majority of the respondents (40.8%) were in disagreement with the statement that the university has enough computer laboratories and this was backed up by a mean score of 2.56 below the threshold of 3 with a standard deviation of 1.286 whereas 38.5% were in agreement. Therefore, majority of the respondents don't have access to a computer whenever there is a class session. Lecturers too find it difficult to group large numbers in a lecture at a particular single period.

The study established whether the university has laboratories equipped with enough computers for lecturers and students. The results indicated that the university doesn't have laboratories equipped with enough computers for lecturers and students since a bigger proportion of the respondents (48.4%) were in disagreement to the statement as indicated by a mean score of 2.531 and a standard deviation of 1.239 whereas 37.7% were in agreement. This implies that students have to struggle to access computers through sharing which makes the teaching and learning process a hurdle.

The study sought to establish whether most students can afford to have smartphones connected to internet in the university and the results were not supportive. It was revealed that majority of the respondents (72.3%) disagreed with the argument that most students can afford to have smartphones connected to internet in this university as indicated by a mean score of 2.115 and a standard deviation of 1.919. Though there are some respondents 15.5% who showed that some students could afford smart phones completely, majority accessed online materials easily since they could afford to own smart phones connected to internet.

In regards to the issue of steady power supply in the computer laboratories, the study findings revealed that the university did not have steady power supply in the computer laboratories since majority of the respondents (57%) were in disagreement with the statement indicated by a mean score of 2.646 below the threshold of 3 with a standard deviation of 1.584. However 38.4% agreed to have steady power supply and this was because of having supplementary power sources like generators and solar energy to supplement UMEME supply thus learning and teaching could hardly be disrupted.

The study also assessed whether there exists enough supporting staff in the computer laboratories that provide assistance during teaching and learning process. The study results

indicate that there are supporting staff in the computer laboratory at the university that provide assistance during teaching and learning process as revealed by a bigger proportion of the respondents (46.9%) who were in agreement to the statement given by a mean score of 3.177 above the threshold of 3 with a standard deviation of 1.296 and only 33.1% were in disagreement. This implies that in the absence of the lecturers, students are easily supported whenever they are in the computer labs due to the presence of technical persons. They help to control servers, log in and out to students' accounts and any other necessary help to the students.

Table 4.23: Lecturers' Perceptions on ICT Infrastructure at Kyambogo University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university has computer laboratories	13.3	18.1	21.2	24.8	22.1	3.243	1.339
The university has laboratories equipped with enough computers for lecturers and students	10.6	14.6	28.3	27.9	18.6	3.292	1.231
Most students can afford to have smartphones connected to internet in this university	27.4	12.8	15.9	24.8	19.0	2.951	1.498
The university has a steady power supply in computer laboratory	23.5	24.3	15.5	15.5	21.2	2.867	1.4757
There are supporting staff in the computer laboratory that provide assistance during teaching and learning process	10.6	16.8	24.3	27.9	20.4	3.305	1.265

Source: Primary data (2022)

According to the respondents, there was a consensus that various laboratories are available to facilitate the teaching process. With 28.6% agreeing and 71.4% strongly agreeing, it indicates a

widespread perception of the presence of multiple laboratories. The mean score of 4.7143 further supports this positive perception, suggesting a high level of agreement among respondents. The standard deviation of 0.46881 indicates relatively low variability in their responses.

Opinions varied regarding whether the laboratories were equipped with enough computers for lecturers and students. With 28.6% strongly disagreeing, 57.1% disagreeing, 7.1% neutral (N), 7.1% agreeing, and 7.1% strongly agreeing, it suggests differing perspectives on the availability of computers in the laboratories. The mean score of 2.0714 indicates a moderate level of agreement or disagreement among respondents. The standard deviation of 1.14114 suggests some variability in their responses.

Respondents expressed mixed opinions about allowing students to use smartphones in lectures to facilitate the teaching and learning process. While 71.4% strongly agreed, 21.4% were neutral, and 7.1% strongly disagreed, it indicated diverse views on the use of smartphones in lectures. The mean score of 1.7143 suggests a moderate level of agreement or disagreement among respondents. The standard deviation of 1.26665 suggests some variability in their responses.

Regarding the availability of steady power supply in the laboratories to enable the teaching and learning process, there was a consensus among respondents. With 50.0% agreeing and 50.0% strongly agreeing, it demonstrated a widespread perception of steady power supply in the laboratories. The mean score of 4.5000 further reinforces this positive perception, indicating a high level of agreement among respondents. The standard deviation of 0.51887 suggested a relatively low variability in their responses.

Respondents indicated a perception of sufficient updated software programs to facilitate teaching, with 64.3% being neutral and 35.7% agreeing. This suggests varying levels of

satisfaction with the availability of updated software programs. The mean score of 3.3571 indicates a moderate level of satisfaction among respondents. The standard deviation of 0.49725 suggested relatively low variability in their responses.

In summary, the descriptive statistics revealed a consensus among respondents regarding the presence of various laboratories to facilitate the teaching process. However, opinions differed concerning the availability of computers in the laboratories and the use of smartphones in lectures. Respondents generally agreed that the laboratories were supplied with steady power, but opinions varied regarding the sufficiency of updated software programs. These findings highlight the variability in respondents' perceptions regarding specific aspects of laboratory facilities and resources for teaching.

Table 4.24: Students' Perceptions on ICT Infrastructure at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
The university has computer laboratories	13.8	34.6	13.1	26.2	12.3	2.555	1.286
The university has laboratories equipped with enough computers for lecturers and students	14.6	33.8	13.8	29.2	8.5	2.531	1.239
Most students can afford to have smartphones connected to internet in this university	37.7	34.6	12.3	9.2	6.2	2.115	1.919
The university has a steady power supply in computer laboratory	36.2	20.8	4.6	19.2	19.2	2.646	1.5841
There are supporting staff in the computer laboratory that provide assistance during teaching and learning process	13.1	20.0	20.0	30.0	16.9	3.177	1.2968

Source: Primary data (2022)

The study sought to establish the respondents' perceptions in regards to ICT infrastructure at Makerere University and the results are presented in Table 4.24.

The findings revealed that Makerere university hasn't enough computer laboratories since majority of the respondents (53.1%) were in disagreement with the statement that the university has enough computer laboratories and this was backed up by a mean score of 3.243 above the threshold of 3 with a standard deviation of 1.339 whereas 46.9% were in agreement with the statement. Therefore, majority of the respondents don't have access to a computer whenever there is a class session and lecturers too find it difficult to converge large numbers in a lecture at a particular single period.

The study established whether the university has laboratories equipped with enough computers for lecturers and students. The results indicate that the university doesn't have laboratories equipped with enough computers for lecturers and students since a bigger proportion of the respondents (53.5%) were in disagreement to the statement as indicated by a mean score of 3.292 and a standard deviation of 1.231 whereas 46.5% were in agreement with the statement. This implies that students have to struggle to access computers through sharing which slows down the teaching and learning process.

The study sought to establish whether most students can afford to have smartphones connected to internet in the university and the results were not supportive. It was revealed that majority of the respondents (56.2%) disagreed with the argument that most students can afford to have smartphones connected to internet in this university as indicated by a mean score of 2.951 and a standard deviation of 1.498. Though there are some respondents (43.8%) who showed that some students could afford smart phones completely, majority accessed online materials easily since they could afford to own smart phones connected to internet.

In regards to the issue of steady power supply in the computer laboratories, the study findings revealed that the university did not have steady power supply in the computer laboratories since majority of the respondents (63.3%) were in disagreement with the statement indicated by a mean score of 2.867 below the threshold of 3 with a standard deviation of 1.475. However, 36.7% agreed to have steady power supply and this is because of having supplementary power sources like generators and solar energy to supplement power supply to facilitate effective   learning and teaching.

The study also assessed whether there exists supporting staff in the computer laboratories that provide assistance during teaching and learning process. The study results indicate that there are supporting staff in the computer laboratory at the university that provide assistance during teaching and learning process as revealed by a proportion of the respondents (48.3%) who were in agreement to the statement given by a mean score of 3.305 above the threshold of 3 with a standard deviation of 1.265.Howevr, 51.7% of the respondents disagreed to the statement implying that in the absence of the lecturers, students are not easily supported whenever they are in the computer labs due to the presence of few technical persons.in their presence however , they help to control servers, log in and out to students' accounts and any other necessary help to the students.

Table 4.25:   Lecturers' Perceptions on ICT Infrastructure at Makerere University

	SD	D	N	A	SA	Mean	Std. deviation
	Percentages						
There are various laboratories to facilitate the teaching process	0	8.3	16.7	33.3	41.7	4.0833	.99620
Laboratories are equipped with enough computers for lecturers and students	0	0	0	66.7	33.3	4.3333	.49237
Students are allowed to use smart phones in the lectures to facilitate the teaching and learning process	0	0	0	50.0	50.0	4.5000	.52223
Laboratories are supplied with steady power to enable the teaching and learning process take place	25.0	41.7	8.3	8.3	16.7	2.5000	1.44600
There are sufficient updated software programmes to facilitate teaching	58.3	8.3	16.7	0	16.7	2.0833	1.56428

Source: Primary data (2022)

According to the respondents, there were various laboratories available to facilitate the teaching process. While 8.3% were neutral, 16.7% disagreed, 33.3% agreed, and 41.7% strongly agreed with this statement. The mean score of 4.0833 indicated a relatively high level of agreement among respondents. The standard deviation of 0.99620 suggests some variability in their perceptions.

Regarding the availability of computers in laboratories for lecturers and students, a majority of respondents (66.7%) strongly agreed and 33.3% agreed. This indicates a consensus among respondents that laboratories are equipped with enough computers. The mean score of 4.3333 further supports this positive perception, suggesting that the majority of respondents believe there are sufficient computers in the laboratories.

In terms of students using smartphones in lectures to facilitate the teaching and learning process, respondents held diverse opinions. While 50.0% agreed, an equal percentage of respondents 50.0% disagreed. The mean score of 4.5000 suggests a relatively balanced level of agreement or disagreement among respondents. The standard deviation of 0.52223 indicated some variability in their perceptions.

Respondents expressed varying views on whether laboratories are supplied with steady power to enable the teaching and learning process. While 25.0% strongly disagreed, 41.7% disagreed, 8.3% were neutral, 8.3% agreed, and 16.7% strongly agreed. The mean score of 2.5000 suggested a moderate level of agreement or disagreement among respondents. The standard deviation of 1.44600 indicates some variability in their perceptions.

Regarding the availability of sufficient updated software programs to facilitate teaching, respondents held diverse opinions. While 58.3% strongly agreed,8.3% disagreed, 16.7% were neutral, and an equal percentage of respondents (16.7%) strongly agreed. The mean score of 2.0833 suggested a moderate level of agreement or disagreement among respondents. The standard deviation of 1.56428 indicates some variability in their perceptions.

In summary, the descriptive statistics revealed diverse opinions regarding the availability of laboratories and the resources within them to facilitate the teaching process. While respondents generally agreed that there were various laboratories and sufficient computers, opinions differed regarding the use of smartphones in lectures and the availability of steady power supply. Additionally, respondents expressed mixed opinions about the sufficiency of updated software programs in the laboratories. These findings highlight the variability in respondents' perceptions regarding the adequacy of resources within the laboratories to support teaching and learning activities.

In regards to ICT infrastructure, some of the Key Informants noted that;

> When it comes to power supply, there are power inconsistences of course and with that no work can get done because computers and all electronic gadgets can only perform via power… (Respondent 04 from Makerere university).

The researcher observed an inconsistence in the reporting between the questionnaire and interviews. The researcher observed that some buildings lack supportive power supply like solar and generators, this could lead to disruption in case of power black-out thus disrupting the on-going online sessions.

> There is use of personal computers by both students and lecturers which are used to access the internet using free Wi-Fi provided by the university and to access personal academic accounts. (Respondent 02 from Makerere University).

Though some respondents said computers are enough, the researcher discovered that some students move with personal laptops to supplement the available computers in the laboratories. This implies an extra cost on the student and the parents.

> There are not enough computers in the computer laboratories so students must go in shifts which slows down teaching as content that would have been covered in a day takes around 3 days to facilitate all the learners. (Respondent 02 from Kyambogo University).
>
> Internet availability is reliable like we have computers connected to the internet and reliable power supply so teaching and learning can go on at any time and also students can always access the computer laboratories if there are no sessions and carry out their personal revision… (Respondent 03 from Makerere University).

This vehemently implies that teaching and learning is continuous with or without the lecturers. This is because of the continued connectivity and consistent aid granted by the laboratory technicians.

The thematic analysis reveals several key themes regarding ICT infrastructure in the educational context. Firstly, the issue of power supply inconsistencies is highlighted, with the dependence of computers and electronic gadgets on a stable power source. Inadequate power supply, such as the lack of supportive power sources like solar or generators in some buildings, is observed to disrupt online sessions during power blackouts. Secondly, the use of personal computers by both students and lecturers, along with access to free university Wi-Fi, is noted. Although some respondents mention that computers are sufficient, it is discovered that some students bring personal laptops to supplement the limited computers available in computer laboratories. This implies an additional cost burden on students and their parents. Thirdly, the insufficient number of computers in computer laboratories is mentioned, resulting in students having to go in shifts and slowing down the teaching process. This extended timeframe to facilitate all learners may cause delays in covering course content.

Lastly, the availability of reliable internet and power supply is emphasized, enabling continuous teaching and learning. Students can access computer laboratories for personal revision even outside scheduled sessions, highlighting the ongoing nature of learning facilitated by laboratory technicians. These themes underscore the challenges and opportunities associated with ICT infrastructure in the educational setting highlighting the impact of power supply inconsistencies, the cost implications of personal computers, the limitations of computer availability in laboratories, and the importance of reliable internet and power supply for continuous teaching and learning.

Table 4.26: Regression Analysis on the Relevancy of ICT Infrastructure on Teaching and Learning at Kyambogo and Makerere Universities

Model Summary (Makerere University)				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.473[a]	.224	.221	.44034
a. Predictors: (Constant), ICT Infrastructure				

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.893	.123		15.351	.000
	ICT Infrastructure	.342	.041	.473	8.271	.000

Model Summary (Kyambogo University)				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.736[a]	.542	.539	.39805
a. Predictors: (Constant), ICT Infrastructure				

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.463	.147		9.946	.000
	ICT Infrastructure	.518	.040	.736	13.094	.000
a. Dependent Variable: Teaching and Learning						

Source: Primary data (2022)

The study sought to establish whether ICT infrastructure has a statistically significant effect on teaching and learning at Makerere University. The researcher conducted a simple linear

regression analysis and the results are presented in Table 4.26. The regression findings indicate a weak positive and statistically significant effect of ICT infrastructure on teaching and learning at Makerere university (B = 0.473, P-value = 0.00<0.05). The regression findings indicate that a unit increase in ICT infrastructure results into an improvement in teaching and learning at the Makerere University by 47.3%. The results imply that as ICT infrastructures increase, it results into an improvement in teaching and learning efficiency at Makerere University.

The model summary results indicate that the coefficient of determination (Adjusted R-square) was 0.221, which indicates that ICT infrastructure explains 22.1% of the total variations in teaching and learning efficiency at the universities and the remaining 77.9% of the total variations are explained by other factors. This implies that ICT infrastructure slightly and significantly plays a relevant role in teaching and learning at Makerere University.

The study sought to establish whether ICT infrastructure has a significant relevancy on teaching and learning at Kyambogo University. The researcher conducted a simple linear regression analysis and the results are presented in Table 4.26. The regression findings indicate a strong positive and statistically significant effect of ICT infrastructure on teaching and learning at Kyambogo university (B = 0.736, P-value = 0.00<0.05). The regression findings indicate that a unit increase in ICT infrastructure results into an improvement in teaching and learning at Kyambogo University by 73.6%. The results imply that as ICT infrastructures increase, it results into an improvement in teaching and learning efficiency at Kyambogo University.

The model summary results indicate that the coefficient of determination (Adjusted R-square) was 0.539, which indicates that ICT infrastructure explains 53.9% of the total variations in teaching and learning efficiency at the universities and the remaining 46.1% of the total

variations are explained by other factors. This implies that ICT infrastructure strongly and significantly plays a relevant role in teaching and learning at Kyambogo University.

Table 4.27: T-test Analysis on the relevancy of ICT Infrastructure on Teaching and Learning between Kyambogo and Makerere Universities

	INSTITUTION	N	Mean	Std. Deviation	Std Error Mean
ICT INFRASTRUCTURE	Kyambogo	133	3.2274	.83255	.07219
	Makerere	226	3.4519	1.05697	.07031

Independent Sample Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
ICT INFRASTRUCTURE	Equal variances assumed	5.235	.023	-2.096	357	.037	-.22444	.10710	-.43506	-.01381
	Equal variances not assumed			-2.227	328.029	.027	-.22444	.10077	-.42268	-.02620

Source: Primary data (2022)

The independent samples t-test was conducted to compare the relevancy of ICT infrastructure and teaching and learning between Kyambogo and Makerere universities. The analysis revealed

a significant difference in ICT infrastructure levels between the two institutions. Kyambogo university had a score (mean = 3.2274, SD = 0.83255), while Makerere university had a score (mean = 3.4519, SD = 1.05697). Both means were average meaning there was moderate relevance of present infrastructures at both institutions. Infrastructure at Kyambogo University (SD = 0.83255) was normally distributed while that at Makerere university (SD = 1.05697) was not normally distributed meaning that at Kyambogo University infrastructures were readily available for use for both students and lecturers regardless of the condition they were than they were at Makerere University.

The t-test showed (Mean difference = -0.22444, P = 0.037<0.005), indicating that at Kyambogo university the relevance of ICT infrastructure was negative and insignificant compared to Makerere university. This finding was further supported by the t-test that accounted for unequal variances, with a similar negative mean difference and a significant p-value (mean= -.22444, P = 0.027<0.005) therefore, Makerere university demonstrated a higher level of ICT infrastructure relevance on teaching and learning compared to Kyambogo university , as supported by both statistical tests.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter is a presentation of summary of findings, discussions, conclusions and recommendations based on the findings presented in chapter four. The researcher then highlights on the areas for further research.

5.2 Summary of Findings

5.2.1 Relationship between Level of ICT Literacy and Teaching and Learning at Kyambogo and Makerere Universities. The correlation and t-test results revealed a weak positive and statistically significant relationship between the level of ICT literacy and teaching and learning at Kyambogo University and a weak positive and statistically significant relationship between the level of ICT literacy and teaching and learning at Makerere University. The results led to the null hypothesis being rejected in favor of the alternative hypothesis, which claimed that Kyambogo and Makerere universities' teaching and learning and ICT literacy levels were statistically related. The findings indicated that an improvement in the level of ICT literacy slightly significantly and moderately leads to an improvement in the teaching and learning at Kyambogo and Makerere universities respectively.

5.2.2 Effect of ICT Connectivity on Teaching and Learning at Kyambogo and Makerere Universities. The study found out that ICT connectivity has a strong positive strong and statistically significant effect on teaching and learning at Kyambogo University and a moderate and statistically significant effect on teaching and learning at Makerere University. The findings

from the t-test and regression results provided enough evidence for the rejection of the null hypothesis in support of the alternative hypothesis that stated that ICT connectivity has a significant effect on teaching and learning at Kyambogo and Makerere universities. However, from data triangulation ICT connectivity had a strong positive effect on teaching and learning at both Kyambogo and Makerere universities. The findings imply that as ICT connectivity increases, it results into a greater improvement in teaching and learning at both Kyambogo and Makerere universities.

5.2.3 Relevancy of ICT Infrastructure on Teaching and Learning at Kyambogo and Makerere Universities. The regression analysis findings and t-test results revealed that ICT infrastructure has a strong positive and statistically significant effect on teaching and learning at Kyambogo University but a weak positive and significant effect on teaching and learning at Makerere University. However, in summary ICT infrastructure has a positive and significant effect on teaching and learning at both the universities. The findings were adequate to disprove the alternative hypothesis, which contended that ICT infrastructure is significantly relevant to teaching and learning at Kyambogo and Makerere universities, and to justify the rejection of the null hypothesis. The results indicate that an increase in ICT infrastructures results into an improvement in teaching and learning at Kyambogo and Makerere universities. Therefore, this implies that ICT infrastructure plays a relevant role in teaching and learning at Kyambogo and Makerere universities.

5.3 Discussion of Study Findings

5.3.1 ICT Literacy and Teaching and Learning at Kyambogo and Makerere Universities. The study found out a weak positive and statistically significant relationship between the level of ICT

literacy and teaching and learning at Kyambogo and Makerere universities. The findings imply that an improvement in the level of ICT literacy slightly but significantly improves on the teaching and learning efficiency at both Kyambogo and Makerere universities. The findings conform to those of Nwosu et al. (2018) who found out that ICT competence and literacy abilities had a positive and significant relationship with teaching and learning in Ogun State, Nigeria.

The study established that the universities have somewhat trained both the students and lecturers on how to use zoom and this positively influences efficiency in teaching and learning at the university thus improving performance of both parties involved. The findings are supported by Zafar (2019) who argued that learners and educators should be trained on how to operate and use the different ICT tools in order to enhance their ICT literacy levels. Most of the lecturers and students knew how to use Google meet during teaching and learning and this implies that students and lecturers had sufficient knowledge on operation of different ICT platforms utilized in teaching and learning which can enable them to perform and deliver content. The findings are in agreement with Zafar (2019) who alluded that learners and educators should be trained on how to operate and use the different ICT tools in order to enhance their ICT literacy levels.

The study found that the universities have created a Moodle platform which is used by all lecturers and students during teaching and learning. This implies that different platforms have been put in place to aid in teaching and learning which in turn can influence the performance of students and lecturers as well as interaction and communication. The findings are in line with Olatoya et al. (2021) who asserted that to improve undergraduate students' ICT literacy skills universities must create platforms and media which can be utilized by students to enhance proficiency and experience in using ICT in the learning process.

In terms of social media use, the study revealed that students and lecturers can ably use more of social media during teaching and learning. This implies that there is efficiency and flexibility in teaching and learning at the universities which allows lecturers and students to share learning materials via social media platforms which eases accessibility to information, lecturers, and communication. The findings are in line with Olatoya and Nekwevha (2021) who asserted that to improve undergraduate students' ICT literacy skills universities must create platforms and media which can be utilized by students to enhance proficiency and experience in using ICT in the learning process.

The findings also revealed that some students and lecturers did not prefer using video conferencing during teaching and learning. This implies that privacy was a major concern among students and lecturers and the inconveniences that arise from video conferencing such as breakage in video loops leading to missing out on content due to poor network connections affected some lecturers' and students' preference for video conferencing. The findings are in agreement with Fidelis and Onyango (2021) who found out that majority of the lecturers lacked technical knowledge in any manner especially in the use of some ICT facilities such as video conferencing and digital technology.

The findings vehemently agree with each constructs from Makerere and Kyambogo Universities. This means that the respondents were satisfied with the ICT Literacy and Teaching and learning. It also means that the questions were clear and directed towards a particular phenomenon.

5.3.2 ICT Connectivity and Teaching and Learning at Kyambogo and Makerere Universities.

The regression analysis results revealed that ICT connectivity has a strong positive and statistically significant effect on teaching and learning at Kyambogo. Results also indicated a

strong positive and significant effect Makerere university. The results imply that an increase in ICT connectivity results into an improvement in teaching and learning at Kyambogo and Makerere universities. This provided enough evidence for the rejection of the null hypothesis in support of the alternative hypothesis which stated that ICT connectivity has a significant effect on teaching and learning at Kyambogo and Makerere universities. The findings are in agreement with Fidelis and Onyango (2021) who found out that internet connectivity had a positive and significant effect on the teaching learning process among public secondary schools in Ngara, Tanzania.

The study found out that the universities have a dependable internet speed. This implies that the internet speed is fast enough and efficient which facilitates teaching and learning at Kyambogo and Makerere universities. This helps students and lecturers to obtain and easily access information online thus improving the teaching learning process. The findings are in line with Azubuike et al. (2021) who argued that for effective integration of ICT in learning the institutions should provide internet with fast speed as well as intranet connections as these would effectively aid in the teaching-learning process.

The findings also revealed that there are intranet connections provided in Kyambogo and Makerere University. This implies that intranet connections that facilitate and aid in teaching and learning are available in the universities and these have a positive influence on teaching and learning process. The findings are in agreement with Azubuike et al. (2021) who argued that for effective integration of ICT in learning, the institutions should provide internet with fast speed as well as intranet connections as these would effectively aid in the teaching-learning process. The study findings indicated that students and lecturers cannot access internet everywhere in the universities. The findings imply that there is limited accessibility to internet in the universities as

it is not accessible in some places within both universities which inconvenience accessibility to information as well as teaching learning process. The findings are in contradiction with Chirwa (2018) who argued that for effective teaching and learning, students and teachers should access and use of internet at all costs everywhere in the college as it facilitates the learning process. The contradiction could have arisen due to the difference in the countries in which these separate studies have been conducted.

The study results showed that the universities have not provided free data to both the lecturers and students to facilitate the teaching and learning process. This implies that provision of free data however much it facilitates and is essential in teaching and learning may not be one of the responsibilities of the university especially for the case of students. This is consistent with Hassan et al. (2020) who found out that limited broad bandwidth and internet access in online teaching made it difficult for professors to offer online courses.

The study findings established that there is free wireless internet connection in the universities. This implies that the university administrations have taken an initiative of providing free wireless internet connection to both the students and lectures which facilitates their accessibility to online academic information and students' interaction with lecturers at any time and this has a positive influence on teaching and learning process thus improving the performance of both lecturers and students. The findings are in agreement with Yebowaah (2018) who found out that internet sources for the students and teachers included free wireless internet and communal internet cafes.

5.3.3 ICT Infrastructure and Teaching and Learning at Kyambogo and Makerere Universities. The study found a strong positive and significant effect of ICT infrastructure on teaching and learning at Kyambogo University but a weak positive and significant effect of ICT

infrastructure on teaching and learning at Makerere University. The findings imply that an increase in ICT infrastructure results into a greater improvement in teaching and learning at Kyambogo University but a slight improvement in teaching and learning at Makerere University. The findings are in agreement with Bariu (2020) who found out that ICT infrastructure had a positive and significant effect on teaching and learning in Secondary Schools in Meru County, Kenya.

The study found out that the different universities have a computer laboratory. The findings imply that students and lecturers have access to different ICT infrastructure such as computers and computer laboratories which they can utilize in the teaching and learning process to improve their performance. The findings are in agreement with Yebowaah (2018) who found out that internet sources for the students and teachers included the School computers, computer laboratories, mobile handsets, domestic internet amenities (free wireless internet), and communal internet cafes.

The study revealed that most of the students can afford to have smartphones connected to internet in the university. This implies that students have smartphones which are examples of ICT infrastructures fully connected to internet and these can be used or utilized to access information and academic content that can be used in the educational process thus significantly influencing student learning and performance. The findings are in line with Yebowaah (2018) who revealed that the main ICT infrastructures used in schools were information and communication laboratory equipped with computers and mobile phones owned by the students and tutors.

The results indicated that the universities have a steady power supply in the computer laboratory. The findings imply that the steady power supply enables both students and lecturers

to have smooth lectures and limited inconveniences especially during classes which improve the learning and teaching process at the universities. The findings are supported by Al-Mamary (2022) who identified simple access to ICT infrastructure, availability of technical support team, effective power supply, time availability, and technology training as major factors influencing the use of ICT in teaching in Yemeni schools.

The study found out that there are supporting staff in the computer laboratories at the different universities that provide assistance during teaching and learning process. This implies that the supporting staff in the computer laboratories can help the lectures and students use different computer infrastructures, soft wares and hard wares in the laboratory as well as providing assistance in accessing different ICT platforms which eases and significantly influences the teaching and learning process at the universities. The findings are in line with Al-Mamary (2022) who identified simple access to ICT infrastructure, availability of technical support team, effective power supply, time availability, and technology training as major factors influencing the use of ICT in teaching in Yemeni schools.

5.4   Conclusions

The conclusions are presented in line with the specific objectives of the study and drawn based on the findings from the study.

5.4.1 Relationship between Level of ICT Literacy and Teaching and Learning at Kyambogo and Makerere Universities. The study found out that ICT literacy has a weak positive and statistically significant relationship with teaching and learning at Makerere University reflected in the use of the various ICT modes of delivery like the use of zoom, Google meet and others which has had a great impact on teaching and learning.

ICT literacy at both universities has been efficiently managed despite some identified shortfalls in applicability of some ICT content delivery media such as video conferencing due to varying preferences which can affect teaching and learning. Therefore, it can be concluded that ICT literacy plays a significant and fundamental role in teaching and learning at Kyambogo and Makerere universities if effectively developed.

5.4.2 Effect of ICT Connectivity on Teaching and Learning at Kyambogo and Makerere Universities. The evidence from the study shows that ICT connectivity has a positive and statistically significant effect on teaching and learning at Kyambogo University. For instance, the university has provided fast internet speed and intranet connections which all have a positive influence on teaching and learning outcomes.

Also evidence from the study shows that ICT connectivity has a positive and statistically significant effect on teaching and learning at Makerere University. The university ably provided free wireless internet connection accessible by both lecturers and students which facilitates teaching and learning hence a positive influence on teaching and learning outcomes.

However, there are some setbacks that could in one way or another affect teaching and learning at Kyambogo and Makerere Universities. To some extent, the study highlighted that the students and lecturers cannot access internet everywhere in both universities which inconveniences accessibility to information as well as teaching learning process at the universities. Therefore, it can be concluded that ICT connectivity play a significant role in improving teaching and learning at Kyambogo and Makerere universities.

5.4.3 Relevancy of ICT Infrastructure on Teaching and Learning at Kyambogo and Makerere University. Basing on the study findings, it is therefore concluded that ICT infrastructure affects

teaching and learning and thus plays a fundamental and significant role in improving the teaching and learning process at Kyambogo and Makerere universities.

5.5   Recommendations

These are presented on each objective and for both universities depending on the study findings, analysis and conclusions.

5.5.1 Relationship between ICT Literacy and Teaching and Learning at Kyambogo and Makerere Universities. The study makes the following recommendations;

Different stakeholders at the universities should find a solution to problems or difficulties that hinder or affect both lecturers' and students' preference for the use of video conferencing at Kyambogo and Makerere universities. Lack of interest in the use of video conferencing was expressed by respondents from both universities yet it is one of the most effective platforms that effects proper classroom management and attendance.

More training should be provided to all students and lecturers on how to use and apply the different ICT tools in the teaching and learning process such as zoom and Google meet at both universities. None of the respondents from both institutions expressed full knowledge on how to operate the various ICT tools in teaching and learning as many shun away from them like recommended MOODLE systems thus the ICT departments should create ICT awareness in the various departments of the institutions.

Different ICT platforms created by the university to be used in the teaching-learning process should easily be accessible and easy to understand and navigate or operate by all students and lecturers at the universities. MUELE AND KELMS for Makerere University and Kyambogo University respectively should be made accessible to both students and lecturers

through more training on the access and use of these platforms since most of the respondents from both institutions complained of lacking access and interest in the use of these platforms.

5.5.2 Effect of ICT Connectivity on Teaching and Learning at Kyambogo and Makerere Universities. The study makes the following recommendations;

More efforts are needed to ensure accessibility of internet at all corners and everywhere within Kyambogo and Makerere universities. At both institutions servers need to be placed in different spots with high bandwidth and password free access for both students and lecturers. This would ease the teaching and learning process through enabling the sessions to be held at anyone's convenience, reduction in breakdowns and enabling sharing of open education resources by students.

Kyambogo and Makerere university administrators should cooperate with internet service providers such as mobile networks to provide free data to students and lecturers or at a lower cost as this facilitates the teaching and learning process. Both institutions being public universities there should be lobbying of discounted data for students and lecturers at a friendly cost to enable effective teaching and learning using ICT.

Kyambogo and Makerere university administrators should ensure that the intranet connections provided are reliable, accessible and of high connection speed. Majority of the respondents from both institutions agreed to have intranet connections in place but they were too restricted thus consideration should be made to ease the teaching and learning process.

5.5.3 Relevancy of ICT Infrastructure on Teaching and Learning at Kyambogo and Makerere Universities. The study makes the following recommendations

Universities should ensure that the computers equipped in the different computer laboratories are fully functional and fully installed with the latest and necessary software that are required by different students in relation to different subjects. Kyambogo university students agreed to possess ICT equipment at their disposal but the lecturers and key informants admitted t that these were equipped with outdated software and hardware whereas at Makerere universities respondents lamented having few ICT equipment in form of computers to facilitate effective teaching and learning key.

Both Universities should ensure steady power supply in the computer laboratories or in instances of power shortage to ensure that teaching and learning effectively takes place without disruptions from power inconsistences. Respondents from both institutions admitted to having a hurdle with power supply thus administrators should provide standby power supplies inform of generators and solar panels to effect continuity of the teaching and learning process as a supplement to UMEME.

There should be enough supporting staff at all times in the computer laboratories to provide the required assistance to all students and lecturers during the teaching and learning process. The two institutions being public universities with a very high number of students there should be employment of assistants to help with classroom management in the ICT sessions at each institution since key informants at Makerere university pointed out the issue of lecturers having to conduct the same class in shifts while Kyambogo university the computer to student ratio was big hence lecturers and students need to be helped in the laboratories.

5.6   Areas for Further Research

Since the study concentrated on only public higher learning institutions that is; Kyambogo and Makerere Universities, there is need for an empirical study on the private higher learning institutions so as to get a broader view on the connection between Information and Communication Technology usage in teaching and learning.

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APPENDICES

Appendix A: Letter of Introduction

KYAMBOGO UNIVERSITY

P. O. BOX 1 KYAMBOGO
Tel: 041 - 4286792 Fax: 256-41-220464
Website :www.kyu.ac.ug, Email: drgt@kyu.ac.ug

Directorate of Research and Graduate Training
Office of the Director

Date: 6th/JUNE/2022

TO WHOM IT MAY CONCERN

RE: MISS NANYANZI RACHIDA

Dear Sir/Madam,

This is to introduce to you the above named student Reg: No 19/U/GMEF/1S640/PD pursuing MASTER OF EDUCATION Department of FOUNDATIONS, Kyambogo University.

· She/he intends to carry out research on A COMPARATIVE ANALYSIS OF THE USE OF ICT IN TEACHING AND LEARNING AT KYAMBOGO AND MAKERERE UNIVERSITIES in partial fulfillment of the requirements for the award of MASTER OF EDUCATION IN EDUCATIONAL FOUNDATIONS

The purpose of this letter therefore is to request you to grant him/her permission to carry out his/her study in your institution.

Any assistance rendered to him/her will be highly appreciated.

Yours sincerely,

Prof. Bosco Bua
AG. DIRECTOR

KYAMBOGO UNIVERSITY
★ 06 JUN 2022 ★
DIRECTOR
DIRECTORATE OF RESEARCH AND GRADUATE TRAINING

Appendix B: Permission to Conduct Research

KYAMBOGO UNIVERSITY

P. O. BOX 1 KYAMBOGO
Tel: 041 -286237, 285001/2 Fax: 041 -220464, 222643
Email: uskyu@kyu/www.kyu.ac.ug

Office of the University Secretary

In any correspondence on
this subject please, quote No: **KYU/R/03**

Date: 21st July 2022

Ms. Nanyanzi Rashida
Reg. No 19/U/GMEF/18640/PD
Kyambogo University
P. O. Box 1
KYAMBOGO

PERMISSION TO CONDUCT RESEARCH

Reference is made to your letter dated, 7th July 2022 requesting for authority to conduct research on the title: *"A Comparative Analysis of the use of ICT in Teaching and Learning at Kyambogo and Makerere Universities"*, as a partial fulfillment for the award of Master's Degree of Education in Educational Foundations of Kyambogo University.

This is to inform you that permission is **granted** to you to conduct the above research at the University. Liaise with the Dean School of Education and Head of Department to guide you on the way forward. On completion, you are expected to furnish this office with a copy of your dissertation.

I wish you the best in your research endeavors.

Regards

Twinamasiko James
FOR UNIVERSITY SECRETARY
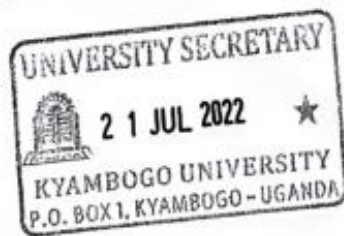
CC: . The Academic Registrar
" The Dean of Students
" The University Librarian
" The Director Research and Graduate Training
" The Dean School of Education
" The Head of Department, Foundations and Educational Psychology

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Appendix C: Questionnaire for Lecturers at Kyambogo and Makerere Universities

A Self-administered questionnaire for lecturers of Kyambogo and Makerere universities on teaching and learning using ICT

KYAMBOGO UNIVERSITY

P.O BOX 1

KAMPALA, UGANDA

10/06/2022

Dear Sir/ Madam/ Dr. / Prof.

You have been randomly selected to participate in this survey as part of the educational requirements leading to the award of a master's degree in educational foundations of Kyambogo University. As one of the lecturers in these universities, you are expected to know the fairing of the use of ICT in facilitating effective teaching and learning. It is on this account that this instrument is with you. Also, you are requested to remember that the findings given will be used for academic purposes only and that they will be treated with utmost confidentiality. Fill it in two weeks and return it completed to your administrative officer in your department.

Yours faithfully,

…………………

Rashida Nanyanzi

This questionnaire is divided into three sections A, B & C. Please complete each section according to the instructions. Do not write your name to ensure complete confidentiality. Please respond to all the questions. Tick (√) where applicable.

Your input in this study is highly appreciated.

SECTION A: BIO-DATA

Tick the most appropriate alternative to you on each of the statements provided.

A1. Gender:

Male	Female
1	2

A2. Marital status:

Single	Married	Others (specify)
1	2	3

A3. Experience:

0-4 years	5-9 years	10-14 years	15+ years
1	2	3	4

A4. Rank:

Junior lecturer	Lecturer	Senior lecturer
1	2	3

A5. University of service:

Kyambogo university	Makerere University
1	2

SECTION B: DEPENDENT VARIABLE

Please follow a scale where 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree and

5 = strongly agree

TL	Teaching with ICT	1	2	3	4	5
TL 1	I prepare for teaching ICT in advance before the semester begins.					
TL 2	I give out ICT course outlines at the beginning of the semester.					
TL 3	I follow the ICT outline until all is covered.					
TL 4	I allow students consultations during the ICT lecture.					
TL 5	I use appropriate ICT teaching methodologies.					
TL 6	I give ICT course works and tests to check on students masterly of knowledge.					
TL 7	I always mark and grade learners on time and give feedback.					

SECTION C: INDEPENDENT VARIABLE

Please follow a scale where 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree and

5 = strongly agree

IL	ICT Literacy	1	2	3	4	5
IL 1	I can ably use zoom to teach.					
IL 2	I know how to use Google meet to teach.					
IL 3	I prefer using the university's Moodle platform to teach.					
IL 4	I know how to conduct lectures through social media.					
IL 5	I have been advised to use video conferencing to teach.					
IC	ICT Connectivity	1	2	3	4	5
IC 1	The university internet speed is fast.					
IC 2	There are intranet connections in the university.					
IC 3	Lecturers can access internet everywhere in the university.					
IC 4	The university has provided free data to facilitate the teaching and learning process.					

IC 5	There is free wireless internet connection in the university.					
II	ICT Infrastructures	1	2	3	4	5
II 1	There are various ICT laboratories to facilitate the teaching process.					
II 2	ICT Laboratories are equipped with enough computers for teachers and learners.					
II 3	ICT Students have smart phones connected to the internet to facilitate the teaching process.					
II 4	ICT Laboratories are supplied with steady power to enable the teaching learning process take place.					
II 5	ICT Laboratories have enough supporting staff to help teachers and learners through the teaching and learning process.					

Appendix D: Questionnaire for Students at Kyambogo and Makerere Universities

Dear respondent,

I am Rashida Nanyanzi, a student of Masters of Education in Educational Foundations of Kyambogo University, conducting a study on the use of ICT and effective teaching and learning at Kyambogo and Makerere universities. I am requesting you to read the given questionnaire and answer the questions appropriately. The information you give will be treated with utmost confidentiality and be used for specifically academic purposes only.

Yours faithfully,

…………………

Rashida Nanyanzi

This questionnaire is divided into three sections A, B & C. Please complete each section according to the instructions. Do not write your name or your University's name to ensure complete confidentiality. Please respond to all the questions. Tick (√) where applicable. Your input in this study is highly appreciated.

SECTION A: BIO-DATA

Tick the most appropriate alternative to you on each of the statements provided.

A1. Gender:

Male	Female
1	2

A2. Marital status:

Single	Married	Others (specify)
1	2	3

A3. Age

20-22years	23-25years	26-28years	above 28years
1	2	3	4

A4. Institution

Kyambogo university	Makerere university
1	2

SECTION B: DEPENDENT VARIABLE

Please follow a scale where 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree and 5 = strongly agree

TL	Teaching and learning	1	2	3	4	5
TL 1	I prepare for ICT lectures in advance before the semester begins					
TL 2	Lecturers give out ICT course outlines at the beginning of the semester					
TL 3	Lecturers follow the ICT outline given until all content is covered					
TL 4	Students are allowed to consult ICT lecturers during the lecture					
TL 5	Lecturers use appropriate ICT teaching methodologies during the lecture					
TL 6	Lecturers give ICT course works and tests to assess students masterly of content					
TL 7	Lecturers always mark and grade learners on time and give feedback					

SECTION C: INDEPENDENT VARIABLE

The independent variable of the study is divided into ICT literacy, ICT connectivity and ICT laboratories. In the subsequent sections, please rate yourself on the items in regards to the following statements.

IL	ICT literacy	1	2	3	4	5
IL 1	My university has trained us on how to use zoom.					
IL 2	I know how to use Google meet during teaching and learning.					
IL 3	My university has created a Moodle platform which all students use.					
IL 4	I can ably use more of social media during teaching and learning.					
IL 5	I prefer using video conferencing during teaching and learning.					

IC	ICT Connectivity	1	2	3	4	5
IC 1	The university internet speed is fast.					
IC 2	There are intranet connections provided in this university.					
IC 3	Students can access internet everywhere in the university.					
IC 4	The university has provided free data to facilitate the teaching and learning process.					
IC5	There is free wireless internet connection in this university.					
II	ICT infrastructures	1	2	3	4	5
II 1	This university has a computer laboratory.					
II 2	The university has laboratories equipped with enough computers for lecturers and learners.					
II 3	Most students can afford to have smartphones connected to internet in this university.					
II 4	The university has a steady power supply in computer laboratory.					
II 5	There are supporting staff in the computer laboratory at the university that provide assistance during teaching and learning process.					

THANK YOU

Dear administrator, you have been purposely selected to participate in this survey as part of the educational requirements leading to the award of a master's degree in educational foundations of Kyambogo University. As one of the university administrators, you are expected to know the factors affecting the use of ICT in effective teaching and learning. It is on this account that this instrument is with you. Please give all the necessary information as requested.

Yours faithfully,

…………………

Rashida

OBJECTIVE ONE: Relationship between ICT Literacy and Teaching and Learning

How have ICT pedagogical approaches influenced teaching and learning in this university?

Can you provide examples of specific ICT pedagogical approaches that have been implemented successfully?

In what ways have these approaches enhanced student engagement and academic outcomes?

How has your ICT knowledge and skills enabled you to facilitate effective teaching and learning in this university?

What specific ICT tools, applications, or platforms have you utilized in your instructional practices?

How have these ICT resources positively impacted your teaching methods and student learning experiences?

OBJECTIVE TWO: Effect of ICT connectivity on teaching and learning

Please describe the access procedure for lecturers and students to ICT facilities in the university.

How easily accessible are the ICT facilities, and are there any limitations or challenges faced by users?

Are there any specific support services or training provided to ensure smooth access to ICT resources?

What is the current state of internet connectivity in the university, and how does it impact teaching and learning?

Can you elaborate on any issues related to network reliability, speed, or bandwidth limitations?

How do these connectivity factors affect the utilization of online resources, multimedia content, or collaborative tools?

OBJECTIVE THREE: Relevancy of ICT infrastructures on teaching and learning

How does the ICT infrastructure, including laboratories and accessories, affect teaching and learning in this university?

What is the computer-to-student ratio, and does it adequately meet the needs of the student population?

Are there any specific challenges or improvements required in terms of infrastructure availability and functionality?

How have you utilized various software applications (e.g., KELMS/MUELE) and hardware to facilitate effective teaching and learning?

Can you provide examples of specific software and hardware utilized in instructional activities?

In what ways have these resources improved teaching efficiency, student engagement, or learning outcomes?

POLICY:

How does the institutional ICT policy impact teaching and learning in this university?

What are the key elements of the ICT policy that directly influence instructional practices?

Are there any measures in place to ensure the effective implementation and enforcement of the ICT policy?

Thank you for your participation and valuable insights in this interview.

Appendix F: Krejcie and Morgan table of sample size determination

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size   *Source: Krejcie & Morgan, 1970*

Appendix G: Plagiarism Test Report

The use of Information Communication Technology (ICT) and Effective Teaching and Learning: Comparative study of Kyambogo and Makerere Universities

by Rashida Nanyanzi

The use of Information Communication Technology (ICT) and Effective Teaching and Learning: Comparative study of Kyambogo and Makerere Universities