

MAKERERE



UNIVERSITY

**TECHNOLOGY-ENHANCED INFORMATION LITERACY TRAINING FOR
STUDENTS AT THE MAKERERE UNIVERSITY LIBRARY**

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2021/HD04/23760U
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**A DISSERTATION SUBMITTED TO THE COLLEGE OF EDUCATION AND
EXTERNAL STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE AWARD OF THE MASTER OF INSTRUCTIONAL DESIGN AND
TECHNOLOGY OF MAKERERE UNIVERSITY**

DECEMBER 2025

DECLARATION

I, Mark Nabende Wamai declare that this dissertation titled: Technology-Enhanced Information Literacy Training for Students at the Makerere University Library, is my original work; and to the best of my knowledge, it has never been submitted to any university or institution for any academic award whatsoever.

Signed.....

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APPROVAL

This dissertation is titled: Technology-Enhanced Information Literacy Training for Students at Makerere University Library has been done by me under the supervision of my two supervisors and it is hereby submitted for examination with their approval.

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Signed.....*Jamiah*.....

Date.....*19/12/2025*.....

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Signed.....*Godfrey*.....

Date.....*19/12/2025*.....

DEDICATION

I dedicate this work to my wife, Rachel, who encouraged me to embark on this journey, and to my children, Tangaza and Atamba, whom I hope will in future refer to it as a source of inspiration to pursue their own paths.

ACKNOWLEDGEMENTS

I thank the Almighty God whose divine guidance gave me the grace to start and complete this journey. I sincerely thank my supervisors, Dr. Jamiah Mayanja and Dr. Godfrey Mayende whose wise counsel and dedication enabled me to complete this work. Lastly, I thank my classmates and friends whose follow-up ensured that I stayed on course.

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LIST OF ABBREVIATIONS/ACRONYMS

ACRL	Association of College and Research Libraries
ADDIE	Analysis, Design, Development, Implementation, and Evaluation
AI	Artificial Intelligence
AR	Augmented Reality
CAES	College of Agricultural and Environmental Sciences
CEDAT	College of Engineering, Design, Art and Technology
CEES	College of Education and External Studies
CHS	College of Health Sciences
CHUSS	College of Humanities and Social Sciences
CILIP	Chartered Institute of Library and Information Professionals
CoBAMS	College of Business and Management Sciences
CoCIS	College of Computing and Information Sciences
CoNAS	College of Natural Sciences
CoVAB	College of Veterinary Medicine, Animal Resources and Biosecurity
COVID-19	Coronavirus disease 2019
CUUL	Consortium of Uganda University Libraries
EFL	English as a Foreign Language
E-Learning	Electronic Learning
ELT	Experiential Learning Theory
ICTs	Information and Communication Technologies
IL	Information Literacy
IT	Information Technology

INASP	International Network for the Availability of Scientific Publications
ISD	Instructional Systems Development
LAW	School of Law
LMS	Learning Management System
MIL	Media and Information Literacy
MISR	Makerere Institute of Social Research
MyLOFT	My Library On Finger Tips
NCHE	National Council for Higher Education
OER	Open Educational Resources
PC	Personal Computer
SCONUL	Society of College, National and University Libraries
SDG	Sustainable Development Goal
UNESCO	United Nations Education Scientific Cultural Organisation
VR	Virtual Reality

ABSTRACT

The rapid evolution of technology and rise of emerging technologies is transforming information literacy (IL) training. Globally, institutions are adopting technology-enhanced online platforms to deliver scalable, accessible IL training, from mobile apps to learning management systems (LMS). At Makerere University Library, the number of students trained in IL is growing annually but remains a small fraction compared to the total student population. This study explored the development of a framework for conducting effective online IL trainings for students at the Makerere University Library. Guided by Kolb's Experiential Learning Theory, the study, through three objectives; explored the perceptions and needs of students undertaking information literacy trainings, established the technologies used to conduct information literacy trainings, and developed a framework for conducting effective online information literacy trainings.

The study adopted a fully mixed sequential equal status explanatory design to utilize the strength of both quantitative and qualitative research methodology, with the unit of analysis being Makerere University students and librarians. Stratified sampling was used to categorize the student population by college in order to ensure adequate representation from each college. For the quantitative component of the study, a sample of 375 students was purposively selected from a total student population of 11,201. The qualitative component comprised 15 librarians purposively selected from a population of 31 librarians. The sample size was determined using Krejcie and Morgan's simplified heuristic approach. Quantitative data was collected with the aid of a self-administered structured questionnaire, and the Cronbach's alpha values measured to ensure reliability of the instrument and content validity and face validity used to determine validity of the instrument. Data was analyzed for mean, median, mode, standard deviation and variance using statistical package for the social sciences, (SPSS). For qualitative data analysis, field notes were

gathered from the interviews with library staff and the audio recordings transcribed verbatim and imported into Microsoft Excel for systematic coding.

Findings from the three objectives depict that firstly, students undertaking training and their instructors perceive information literacy as important and that students perceive instructors as knowledgeable and supportive during training. Secondly, findings depict that some forms of technology are currently used in information literacy training at the Makerere University Library, and that these technologies are easy to access, navigate and that they enhanced the learning experience of users. And finally, the findings present key considerations that informed the development of a framework for conducting effective information literacy training online, guided by the ADDIE Model's five phases. Each of the five phases integrated learner-centred, technological and institutional components, interconnected by OER, partnerships, and analytics as crosscutting enablers. The study recommends procuring more computers and bandwidth for training, incorporating IL in curricula, prioritizing mobile, offline-capable platforms, OER integration, librarian training, librarian recruitment to ensure scalability of training across entire university, and telecom partnerships to ensure sustainability and inclusivity in Uganda's low-resource context through zero-rating the university domain.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This study investigates technology-enhanced information literacy training for students at the Makerere University Library. This section covers the background of the study, statement of the problem, the purpose of the study, research objectives, research questions, significance of the study, scope of the study and the theoretical underpinning.

1.1 Background of the study

Historically, the evolution of IL training in higher education has transitioned from basic capacity building to dynamic, technology-integrated models, reflecting digital advancements and global disruptions. The COVID-19 pandemic in 2020 catalyzed a rapid shift to online IL delivery and accelerated uptake of mobile and virtual platforms (Pokhrel & Chhetri, 2021). By 2022, research emphasized interdisciplinary integration and assessment, further establishing IL's role as a means to foster critical thinking amid digital proliferation (Chen *et al.*, 2022). From 2023 onwards, studies focused on mobile IL trends, noting increased adoption of gamified e-tutorials and Artificial Intelligence (AI) for personalized learning (Pinto *et al.*, 2020). In the last one year, despite unprecedented opportunities for personalized learning AI presents, studies show concerns that excessive dependence may undermine users' critical thinking capacities and give rise to ethical challenges (Rezaee Noor *et al.*, 2025).

Theoretically, IL training is anchored in constructivism, which posits that learners construct meaning from their experiences (Matriano, 2020), and connectivism, which acknowledges that

learning occurs through connecting information sets and making new connections that enable learners improve their current state of knowledge (Siemens, 2005).

Conceptually, Technology-enhancement with regard to education is described by researchers as an interdisciplinary field intersecting learning sciences, educational psychology, and computer science, that uses of information and communication technologies (ICTs) to augment teaching and learning outcomes, by integrating current technologies and designing innovative ones, hinged on their flexibility, accessibility, and ability to overcome temporal and spatial limitations (Abdullah *et al.*, 2016; Bourdeau & Balacheff, 2014; Pammer-Schindler *et al.*, 2020). As such, terms like eLearning and online learning, as well as more specialized fields such as game-based learning, web-based learning, and others, are part of the research field of technology-enhanced learning (Schweighofer & Ebner, 2015). Information Literacy (IL) is defined by the Association of College & Research Libraries (ACRL) as “the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning” (ACRL, 2016, p. 3).

Knowledge creation is to a great extent influenced by published research. The number of articles downloaded from the Makerere University Library is on the rise. For example, in 2022, 1,007,978 full-text documents were downloaded compared to 894,374 in 2021, while 657,192 full-text documents downloaded in 2020 and 799,463 in 2019. The rising number of downloads is attributable to increasing number of information literacy trainings conducted by the library. 7,108 undergraduate and postgraduate students were trained in 2022, while 3,609, 484 and 1,506 students were trained in 2021, 2020 and 2019 respectively (MakLIB, 2023). Nevertheless, the total of 3,609 undergraduate and postgraduate students trained in information literacy for the year 2021

(MakLIB, 2023) were approximately 11.3% of the total student enrollment for Academic Year 2021/22 which stood at 31,934 (Mak, 2022a).

A research gap therefore persists in African university contexts, where 21st century skills are insufficiently developed due to inadequate digital infrastructure, unprepared lecturers, and outdated or nonexistent ICT policies, which all hinder the effective adoption of technology in teaching (Ndibalema, 2025). While Global North research demonstrates 75–85% engagement in mobile-enhanced IL (Caffrey *et al.*, 2023; McGuinness & Fulton, 2019), Ugandan institutions like Makerere face underexplored challenges, including low e-resource utilization due to connectivity and digital literacy gaps (Kinengyere, 2007), necessitating tailored frameworks for equitable IL delivery.

The study examined technology-enhanced information literacy training for students at the Makerere University Library. Specifically, the research objectives were: to explore the perceptions and needs of students undertaking information literacy trainings at the Makerere University Library; to establish the technologies used to conduct information literacy trainings for students at the Makerere University Library; and to develop a framework for conducting effective online information literacy trainings for students at the Makerere University Library.

1.2 Statement of the problem

The number of in-person information literacy trainings conducted by the Makerere University is growing annually, with 7,108 undergraduate and postgraduate students trained in 2022 compared to 3,609 the previous year. However, these in-person trainings, while valuable, are constrained by fixed schedules, geographical limitations, and inadequate facilities, as evidenced in recent African studies. For instance, in Nigerian colleges, poor Internet connectivity, inadequate ICT facilities,

power supply issues, obsolete technology, lack of skilled personnel, cyber security risks, digital literacy gaps, budget constraints, accessibility problems and policy affect efficient delivery of IL (Abdullahi & Lawan, 2025). Similarly, South African institutions report inadequate lecturer venues with facilities needed to teach IL, inadequate human resources to teach IL, lack of collaboration between academics and librarians, inadequate methods of offering IL programmes, and lack of IL policy as challenges for teaching IL (Ndou & Zimu-Biyela, 2023).

At Makerere University, IL training is conducted synchronously in a multi-purpose training laboratory equipped with only 32 computers at a computer-to-student ratio of 1:47 that far exceeds the National Council for Higher Education (NCHE) recommended ratio of 1:5 (Musoke *et al.*, 2014). Furthermore, the broad scope of IL training covering; using the online catalog, database searching, reference management, evidence-based research, basic user orientation to information services, systematic reviews, anti-plagiarism checks, and library support systems such as MyLOFT, Endnote, Virtua and Libhub (MakLIB, 2023) requires more time and learner-instructor interaction to grasp than currently allocated, mirroring challenges in Kenya, where the right initiatives, resources and ICT infrastructure were deemed essential for IL training (Magut & Lelon, 2022).

These limitations compromise learning quality by restricting hands-on practice and personalized feedback, resulting in uneven IL skill acquisition. Consequently, graduates risk not developing essential skills in finding information effectively, critically evaluating information and creatively applying it as part of knowledge construction (Ozor & Toner, 2022). Empirical evidence from Zimbabwean universities further justifies this, showing that infrastructure deficits lead to 20% dropout rates in IL sessions, exacerbating digital divides (Huang, 2024). The lack of adequate technology-enhanced IL training programs at Makerere University remains a critical problem, as

the current capacity of multi-purpose training laboratory cannot scale to tens of thousands of students. To solve this, there is an urgent need to deploy online, mobile-compatible IL solutions that expand access, personalize learning, provide timely feedback based on analytics and ensure inclusivity. This study assessed students' perceptions and needs, established current technologies, and developed a framework for effective online IL training at Makerere University Library to bridge these gaps.

1.3 Purpose of the study

The study examined technology-enhanced information literacy training for students at the Makerere University Library.

1.4 Research objectives

The study was guided by the following objectives:

- a) To explore the perceptions and needs of students undertaking information literacy trainings at the Makerere University Library.
- b) To establish the technologies used to conduct information literacy trainings for students at the Makerere University Library.
- c) To develop a framework for conducting effective online information literacy trainings for students at the Makerere University Library.

1.5 Research questions

- a) What are the perceptions and needs of students undertaking information literacy trainings at the Makerere University Library?
- b) What technologies are used to train students in information literacy at the Makerere University Library?

- c) What guidelines can inform the development of a framework for conducting effective online information literacy trainings for students at the Makerere University Library?

1.6 Significance of the study

The study is expected to benefit students of Makerere who undertake information literacy trainings conducted by the University Library. The outcome of this study; a framework for conducting effective technology-enhanced information literacy training for students at the Makerere University Library is expected to not only boost the numbers of students trained but also provide a blueprint for how information literacy training can be conducted online by other institutions. Ultimately, students who have undergone information literacy will be better equipped to utilise the rich collection of resources in academic Libraries including Makerere University's, produce richer reports, articles and publications, which will in turn enable them to publish in high-impact journals, which will improve the overall academic and research credibility of their institutions.

Lifelong learning, creativity, and work performance of beneficiaries has been shown increase as their levels of information literacy skills increase (Saadia & Naveed, 2024). This study is therefore primed to inform policy and practice in as far as how technology-enhancement can boost access, engagement, completion, and satisfaction with regard to information literacy training. Furthermore, the study will contribute to existing research on technology-enhanced information literacy training and seek to provide insights for future research that will investigate the relationship between technology-enhanced information literacy training and lifelong learning, creativity and producing versatile graduates.

1.7 Scope of the study

The scope of this study was restricted to examining how technology can be used to enhance information literacy training among students at the Makerere University Library.

1.7.1 Content scope

The study focused on information literacy training at Makerere University which covers topics such as; using the online catalog, database searching, reference management, evidence-based research, basic user orientation to information services, systematic reviews, anti-plagiarism checks as well as use of library digital support systems such as Virtual-Integrated Library system, MYLOFT, Libhub and Endnote (MakLIB, 2023). The scope of content covered by this study was therefore restricted to the learning materials used to equip users with skills to use the aforementioned tools and resources.

1.7.2 Geographical scope

The study was carried in the context of the Makerere University Main Library. This was informed by the fact that majority of information literacy training is carried out in the Main Library's multi-purpose training laboratory (Musoke *et al.*, 2014).

1.7.3 Time scope

The study considered information literacy training conducted over a three-year period from 2020 to 2022. This was informed by the availability data on information literacy trainings for the three-year period and observable increase in number of users undertaking information literacy training at the University Library (MakLIB, 2023).

1.8 Theoretical underpinning

This study was guided by Kolb's Experiential Learning Theory (ELT). The theory developed by David A. Kolb in 1984 is a result of the study of works of foundational scholars such as William James, John Dewey, Kurt Lewin, Jean Acri, Lev Vygotsky, Carl Jung, Mary Parker Follett, Carl Rogers, and Paulo Freire, and explains how one's experience can be translated into learning and reliable knowledge. It posits that experiential learning occurs through a four-stage cycle made up of two modes of grasping experience; Concrete Experience (CE) and Abstract Conceptualisation (AC), as well as two modes of transforming experience; Reflective Observation (RO) and Active Experimentation (AE). The choice of ELT is informed by the foundation it lays for an approach to education and learning as a lifelong process, through adoption of a framework that examines and strengthens the critical linkages between education, work, and personal development (Kolb, 2014). Information literacy training by virtue of the information-related tasks such as finding, accessing, using, managing, and creating has a direct and positive effect on students' creative skills (Naveed *et al.*, 2023). These creative skills that information literacy training imparts to students are important as Makerere University aspires to transform into a research-led institution with a multi-faceted research agenda, enhanced engagement with industry players, increased graduate training, and innovations that promote the transfer of academic knowledge into solutions that are responsive to the developmental and social challenges in society (Mak, 2022b).

As such, constructivism, which posits that learners construct meaning from their experiences guided this study. The choice of constructivism is further informed by experiential learning's emphasis on learning through reflection on experience, which enables individuals to gain and construct knowledge by interacting with their environment through a set of perceived experiences and/or perceived problem (Matriano, 2020). On this basis, this study proposes that technology can

be used to enhance information literacy training by translating the teaching resources already available for physical training to an online environment where learning that is normally restricted to instructor presence, specific times and physical spaces can be made accessible for users at any location and time of their convenience.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the review of relevant literature. The chapter is made up of five sections and the key aspects reviewed include; perceptions and needs of users undertaking information literacy, technologies used to train information literacy, and frameworks for effective online information literacy. The third section explores empirical studies, while the fourth outlines concepts followed by a conclusion.

2.0.1 Definitions, scope and importance of information literacy

Information Literacy (IL) is defined by the Association of College and Research Libraries (ACRL) as “the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning” (ACRL, 2016, p. 3). The Chartered Institute of Library and Information Professionals (CILIP) further defines information literacy as "the ability to think critically and make balanced judgements about any information we find and use. It empowers us as citizens to develop informed views and to engage fully with society" (CILIP, 2018, p. 3).

ACRL and CILIP further define the scope of IL through competencies such as: determining information needs, accessing information efficiently, evaluating sources critically, using information effectively, understanding ethical/legal issues, and using critical thinking to evaluate digital content and combat misinformation especially in the age of social media. As such, IL is

important in preparing participants in higher education for academic research, workplace problem-solving, and lifelong learning, with emphasis on use of library-based and digital resources, which empowers them to navigate online platforms, assess news sources, and make informed decisions in civic and professional life (ACRL, 2000; CILIP, 2018).

2.0.2 Core competencies and standards of information literacy

The United Nations Education Scientific Cultural Organisation (UNESCO)'s frameworks governing information literacy have evolved from governing library-focused skills to broader goals of media literacy, digital access, and global citizenship. The UNESCO Information Literacy Framework (2008-2008) highlights key elements such as; Access – the use digital and traditional tools to retrieve information, Evaluation – Ability to critically assess information quality, Application – Ability to use information ethically in personal and societal contexts, and Empowerment – Information Literacy as a human right supporting civic participation and lifelong learning (Catts & Lau, 2008).

The UNESCO Media and Information Literacy (MIL) Curriculum (2011) integrates Information Literacy with media literacy, and outlines competencies for educators such as; Access and Retrieval – Ability to use digital tools like online databases and search engines, Understanding and Evaluation – Ability to analyze media and information for bias and credibility, Creation and Sharing – Ability to produce and share information ethically, and Civic Engagement – Ability to use information for democratic participation and global citizenship (UNESCO, 2011). Furthermore, the UNESCO Global MIL Assessment Framework (2013) framework provides indicators to assess Information Literacy and media literacy at national and individual levels.

Individual Competencies assess skills in accessing, evaluating, and using information/media, the Policy Environment addresses national policies promoting MIL.

Additionally, the Society of College, National and University Libraries (SCONUL) in the United Kingdom (UK) and Ireland lays out seven pillars for practical Information Literacy instruction designed for higher education and lifelong learning. They include; Identify – Ability to recognize an information need, Scope – Ability to assess knowledge gaps, Plan – Ability to develop search strategies, Gather – Ability to locate and access information, Evaluate – Ability to assess relevance and reliability, Manage – Ability to organize and use information ethically, and Present – Ability to share findings effectively (SCONUL, 2011).

2.1 Theoretical review

2.1.1 Student perceptions and needs in information literacy training

As we set out to determine the perceptions and needs of participants in information literacy trainings, it was important to note that there is a relationship between their opinions and their use of tools, with the groups that have a higher opinion deciding to use more tools in a wider variety of ways (Shire & McKinney, 2021). Additionally, McGuinness and Fulton (2019) noted that gamification of digital information literacy tutorials through quizzes and badges fostered students' active participation with higher engagement reported for self-paced modules compared to traditional lectures. Similarly, Liu and Li (2025) who evaluated the implementation of Information Literacy Programs using micro-courses among thirty Chinese Universities reported that the accessible bit-sized content resulted in 83% of universities reporting high student participation.

Gilats (2021) who conducted a usability and usefulness evaluation research in four public university digital libraries in Ethiopia reported that participants' information literacy skills have an important impact on the ease of use. Learnability for participants with more information literacy skills tended to be easier compared to those with less information literacy skills whose learnability was problematic. Ultimately, effective participation by students in Information Literacy training is hindered by a number of factors relating to; infrastructure and technology such as poor internet connectivity and lack of devices, lack of prior information literacy skills and awareness, lack of training integration into formal curricula and insufficient institutional support, technological complexity and usability issues associated with poor interface design, socioeconomic factors such as cost of internet and devices, cultural barriers such as preferences for traditional pedagogies, and lack of trained facilitators as well as resource constraints such as staffing shortages (Choundhary & Bansal, 2022; McGuinness & Fulton, 2019; Liu & Li, 2025; Hughes *et al.*, 2019; Pérez-Escoda *et al.*, 2019; Caffrey *et al.*, 2023).

Students' training needs are further influenced by a number of factors such as gender, with female students reporting lower confidence in using digital tools compared to their male counterparts, and yet demonstrating stronger critical evaluation skills when assessing online content for credibility (Aharony & Gazit, 2019), as well as higher engagement with collaborative tasks compared to males (Choundhary & Bansal, 2022). Students from different disciplines also present with different training needs with science students demonstrating need for advanced database searching skills due to reliance on peer-reviewed articles, while humanities students showed need for training in evaluating diverse sources, and social science students, the need for prioritizing data analysis tools (McGuinness & Fulton, 2019).

The year-of-study has also been shown to influence training needs with first-year students requiring basic Information Literacy skills in library navigation and search strategies, while third-year and postgraduate students require advanced skills in systematic reviews and citation management. First-years report lower engagement due to unfamiliarity with digital tools and perceived irrelevance to coursework, while postgraduates demonstrate higher engagement and satisfaction due to training's relevance to their research needs (Hughes *et al.*, 2019; Corral & Jolly, 2022).

Feedback mechanisms such as automated scoring in gamified modules delivered via a Learning Management System, mobile-based applications, and AI-driven tutorials, as well as human-mediated feedback delivered by instructors have been shown to provide learners with timely, constructive, and actionable information that increases engagement, improves critical thinking and helps improve Information Literacy skills (McGuinness & Fulton, 2019; Huang, 2024; Choundhary & Bansal, 2022). Essentially, student-centered approaches such as; co-creation of tasks, focus on real-world applications, choosing discipline-specific tasks, self-paced learning and interactive tasks are shown to enhance Information Literacy delivery (Ball, 2019; Almenara *et al.*, 2022; Liu & Li, 2025).

2.1.2 Technologies supporting information literacy instruction

The evolution of new information and communication technologies (ICTs) has led to a clear revolution in the field of education, with aspects such as online learning becoming increasingly important (Humeniuk & Romaniuk, 2023). A study by Shire and McKinney (2021) on the use of Web 2.0 amongst librarians that teach IL at university libraries in the UK revealed that YouTube, blogs, and Wikipedia continue to be relevant for improving student engagement, facilitating course

delivery, advertising courses, and illustrating IL concepts. Furthermore, a study by Kozma (2003) on innovative use of technology in the classroom across 28 countries revealed that students developed positive attitudes towards learning, and acquired new subject matter knowledge or collaborative skills, as well as new skills for studying, communicating, handling information or problem solving. This is substantiated by Mutula (2010) whose study among first year students at the University of Botswana indicated that online information literacy enhanced the computer literacy, especially with respect to searching and retrieving information from the internet, and made submitting of assignments, independent learning, convenience of doing assignments at their own time and communicating online enjoyable.

Traditionally Information Literacy training focuses on structured, librarian-led sessions to develop students' research skills through in-person lectures that are mostly effective for small groups of students, and is limited in scalability due to resource constraints associated with number of trained librarians and physical space available (Johnston & Webber, 2003; Julien & Hoffman, 2008). On the other hand, digital approaches to Information Literacy training integrate digital tools such as learning management systems e.g., Moodle, databases, online modules, virtual workshops, and interactive tools to enhance learners' competencies such as digital skills, critical thinking, and problem-solving, while promoting teachers' creativity, problem-solving, and self-confidence (Pérez-Escoda *et al.*, 2019; Tinmaz *et al.*, 2022).

Emerging technologies such as generative Artificial Intelligence (AI), mobile technologies, virtual reality and augmented reality, gamification, learning management systems (LMS) such as Moodle, Canvas and digital tools such as Google Scholar, Citation software are transforming Information Literacy training by enabling data-driven decision-making and adaptive learning, facilitating interactive learning, enhancing engagement and technical skills, improving critical evaluation

skills, and supporting scalable training (Huang, 2024; Tinmaz *et al.*, 2022; Almenara *et al.*, 2022; McGuinness & Fulton, 2019; Caffrey *et al.*, 2023).

Corrall and Jolly (2022) who examined the University of Limerick, Ireland Library's use of virtual workshops to teach Information Literacy and digital literacy using Moodle discovered that it increased accessibility, despite technological barriers associated with internet connectivity. Furthermore, a case study by Huang (2024) on AI integration in Information Literacy training, using tools like ChatGPT to personalize learning and teach students at Bindura University, Zimbabwe to evaluate AI-generated content for credibility and bias discovered that it improved student engagement and critical thinking but faced barriers like limited infrastructure and librarian training.

2.1.3 Models and frameworks for effective online information literacy delivery

Information Literacy instruction in the higher education context is supported by a number of models that ensure that learners develop competencies in accessing, evaluating, and using information ethically (ACRL, 2016; UNESCO, 2011). According to Guo and Zhu (2019), the embedded information literacy model refers to institutions integrating instruction into their specialized curricula through collaboration and coordination among different departments and administrations so as to enable students improve their skills in line with clearly pre-set targets. On the other hand, the standalone information literacy model offers fundamental concepts and skills that can provide a structured framework for student development through courses that are only integrated into specialized institutional curricula as required or in the form of elective courses (Diddi & Tomar, 2023). Additionally, with the blended information literacy model a portion of

learning takes place face-to-face and a portion takes place online (McCue, 2014), combining real-time interaction with self-paced learning.

A more comprehensive approach, the collaborative partnership model, relies on linkages between libraries, academic units, and specialized centres to deliver information literacy with emphasis interdisciplinary collaboration that aligns training with academic needs and enhances use of emerging technologies (Corrall & Jolly, 2022; Almenara *et al.*, 2022). A cost-effective approach, the scalable online model, makes use of platforms such as MOOCs and mobile apps to deliver information literacy in a modular and incremental ways that address poor connectivity and aim to increase participation (Choundhary & Bansal, 2022; Liu & Li, 2025).

In order to ensure that learners develop competencies in accessing, evaluating, and using information ethically, it is important to provide structured approaches to designing, delivering, and evaluating information literacy (IL) programs (ACRL, 2016; UNESCO, 2011). These structured approaches or frameworks include the ADDIE (Analysis, Design, Development, Implementation, Evaluation), an instructional systems development (ISD) model that provides a systematic process for creating effective information literacy programs (Molenda, 2003).

In terms of application, the ADDIE Model offers a practical, evidence-based, and transparent framework for developing sustainable online IL training when adapted as a cyclical, lightweight, mobile-first process (Huang, 2024). In terms of strengths, the Model's systematic process allows for continuous refinement, while its phased structure enables under-resourced institutions to solicit and secure funding transparently according to each stage completed. In terms of weaknesses, the model assumes that there is stable ICT and power infrastructure in place for implementation, which

is not usually the case for sub-Saharan Africa, and requires a lot of time and resources to implement, which can burden small teams (Molenda, 2003).

Additionally, the Association of College and Research Libraries (ACRL) framework that provides six conceptual frames to guide information literacy instruction, emphasizing critical thinking and contextual learning. The ACRL frames include; Authority Is Constructed and Contextual, Information Creation as a Process, Information Has Value, Research as Inquiry, Scholarship as Conversation, and Searching as Strategic Exploration (ACRL, 2016).

Another framework, the Society of College, National and University Libraries (SCONUL) in the United Kingdom (UK) and Ireland lays out seven pillars namely; Identify, Scope, Plan, Gather, Evaluate, Manage, and Present, to guide practical information literacy instruction for higher education and lifelong learning (SCONUL, 2011). Additionally, the UNESCO Media and Information Literacy (MIL) framework integrates Information Literacy with media literacy, and outlines competencies for educators such as; Access and Retrieval, Understanding and Evaluation, Creation and Sharing, and Civic Engagement (UNESCO, 2011).

Furthermore, the Backward Design Model makes use of a three-stage approach; identify desired results, determine acceptable evidence, and plan learning experiences and instruction, to ensure alignment between information literacy goals and instruction and support outcome-driven assessment (Wiggins & McTighe, 2005).

Some of the global best practices emerging from information literacy training frameworks include; the ACRL framework's promotion of; Curriculum Integration that embeds information literacy courses into institutional curricula, Flexible Implementation that allows for customization of training for specific institutional contexts, and the use of rubrics and analytics for Assessment of

learning outcomes (Corrall & Jolly, 2022; Caffrey *et al.*, 2023). The SCONUL model equally promotes Flexible Implementation through supporting asynchronous and asynchronous learning as well as Assessment through use of performance-based tasks to evaluate its seven pillars namely; Identify, Scope, Plan, Gather, Evaluate, Manage, and Present, as well as promotion of Progressive Learning through structuring of information literacy from basic to advanced skills requirements (McGuinness & Fulton, 2019; Hughes *et al.*, 2019).

Additionally, the UNESCO Digital Literacy Global Framework (2018) that was developed to support SDG 4 (Quality Education) promotes inclusivity by covering competences such as familiarity of users with hardware, software, and career-related skills so as to address global digital divides, as well as promotes Scalable Design by supporting mobile-based interventions that serve as a pathway to tailor information literacy to local contexts where use of mobile phones is high (Law *et al.*, 2018). A newer framework, InFlow, is a flexible, student-centered information literacy model that consists of eight elements (Ask, Collaborate, Explore, Imagine, Make, Map, Reflect, Show), which can be used in any order to create traditional outputs such as essays or creative outputs such as artefacts, videos, with emphasis on inquiry and creativity. InFlow also promotes best practices such as Simplicity and Flexibility, Learner Empowerment that enables students to plan independently, and Cultural Relevance, which incorporates socio-cultural contexts and promotes adaptability of training to diverse regions (McNicol & Shields, 2014).

As such, elements of an effective information literacy framework in the digital age include: alignment with established global standards like the ACRL Framework for Information Literacy (2016) or UNESCO's Media and Information Literacy (MIL) Framework (2011), which has been found to increase learner engagement with content (Corrall & Jolly, 2022); a learner-centred and contextual design that tailors content to current skills and specific disciplines such as use of

gamified tutorials to increase course completion rates (McGuinness & Fulton, 2019); and integration of digital tools and technologies such as learning management systems (LMS), Artificial Intelligence to provide adaptive feedback to users (Huang, 2024).

Other elements include: flexible and scalable delivery modes that support both synchronous and asynchronous content delivery for blended learning so as to enhance completion rates (Hughes *et al.*, 2019); robust assessment and learning analytics leveraging affordances of digital tools such as Learning Management Systems (LMS) to track student engagement and skill gaps (McGuinness & Fulton, 2019); inclusivity and accessibility so as to address learner differences in gender, discipline, digital skills, connectivity, culture and increase participation (Choundhary & Bansal, 2022; Hughes *et al.*, 2019); faculty and library collaboration so as to ensure training relevance to institutional goals and enhance delivery (Corrall & Jolly, 2022).

2.1.4 Instructional design and pedagogical approaches for online information literacy

A number of learning theories that address engagement, interaction, and skill development (Kinengyere, 2007) provide a good basis upon effective Information Literacy training can be designed and delivered in digital learning environments. According to Kolb (2014), constructivism posits that learners construct knowledge through active engagement with their environment, building on prior experiences. Ball (2019) who studied students' use of a Wikipedia-based Information Literacy program reported 90% engagement as students collaboratively edited articles, constructing knowledge through peer interaction and real-world application.

Connectivism, another learning theory applicable to Information Literacy proposed by Siemens (2005), acknowledges that learning occurs through connecting information sets and making new connections that enable learners improve their current state of knowledge. Corrall and Jolly (2022)

who used Moodle to connect students at the University of Limerick with peers and electronic resources such as EndNote and databases during virtual Information Literacy workshops reported that engagement increased by 25% due to networked learning. Additionally, the social learning theory by Bandura (1977) notes that new knowledge or patterns of behavior can be acquired through direct experience or observing the behavior of others and interacting with them. Choundhary and Bansal (2022) who studied gamified digital literacy training programs among learners in India observed that engagement particularly among female learners who preferred collaborative activities increased as a result of social learning through group-based mobile app tasks.

Kolb's Experiential Learning Theory (ELT), which guided the study posits that experiential learning occurs through a four-stage cycle made up of two modes of grasping experience; Concrete Experience (CE) and Abstract Conceptualisation (AC), as well as two modes of transforming experience; Reflective Observation (RO) and Active Experimentation (AE). ELT approaches education and learning as a lifelong process, through adoption of a framework that examines and strengthens the critical linkages between education, work, and personal development (Kolb, 2014).

ELT, when applied to situations where learning occurs in stages has been reported to improve learners' evaluation skills especially after guided reflection (Abdulai *et al.*, 2021). As such, strengths of the theory include; promotion of deep transferable learning, high compatibility with digital tools, encouraging of active, student-centred design, and scaffolding for learners with low digital literacy, while weaknesses include; requirement for multiple time-intensive cycles to implement, assumptions that learners are autonomous and self-motivated, and difficulty in assessing large classes (Almenara *et al.*, 2022; Huang, 2024).

Relatedly, Knowles (1975)'s self-directed learning process is defined as one in which "individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18). For example, the deployment of e-tutorials for Information Literacy training at Queensland University of Technology enabled students to self-direct their learning by focusing on basic skills like library navigation, which resulted in completion rates and satisfaction rates of 70% and 80% respectively, due to flexibility (Hughes *et al.*, 2019).

Sweller (1988)'s Cognitive Load theory further posits that the greater the degree of reasoning applied during conventional problem-solving increases complexity of tasks and hinders achievement of intended learning outcomes. A study by Pérez-Escoda *et al.* (2019) among female pre-service teachers in Spain found that deployment of user-friendly Learning Management Systems for Information Literacy training with clear instructions and intuitive tools reduced cognitive load for pre-service teachers with up to 80% reporting satisfaction.

Therefore, best practices for designing online Information Literacy training content include; student-centered design that caters for prior knowledge by incorporating tutorials with gamified tasks to increase engagement (McGuinness & Fulton, 2019), incorporation of interactive and collaborative tasks that promote social learning and peer modeling (Ball, 2019), ensuring low cognitive load through designing user-friendly interfaces with clear instructions (Pérez-Escoda *et al.*, 2019), provision of timely and actionable feedback through use of automated (McGuinness & Fulton, 2019) and instructor-led feedback mechanisms (Corrall & Jolly, 2022), incorporation of emerging technologies such as AI-driven tutorials that provide adaptive feedback, customize learning experiences and improve critical thinking (Huang, 2024), designing of accessible and

inclusive content for diverse learners that addresses gender differences (Choundhary & Bansal, 2022), differences in user skills, year-of-study (Hughes *et al.*, 2019) and discipline-specificity (McGuinness & Fulton, 2019), and integration into curriculum to enhance engagement and satisfaction (Caffrey *et al.*, 2023).

In terms of delivery of Information Literacy, synchronous and asynchronous models offer distinct approaches, with synchronous ones supporting real-time interactions and feedback between the instructor and learners, while asynchronous models support interactions and feedback between the instructor and learners at different times facilitated by printed or digital content such as pre-recorded audios or videos with flexibility in time (Shahabadi & Uplane, 2015). For example, the use of synchronous virtual workshops to teach Information Literacy skills at the University of Limerick led to high engagement reported at 80%, with 80% of participants rating the workshops as “very useful” owing to the interactive instructor-led question and answer sessions and personalized guidance (Corrall & Jolly, 2022).

On the other hand, Choundhary and Bansal (2022) who studied the use of asynchronous mobile applications with gamified content to deliver Information Literacy in India reported that although flexibility and gamification afforded by mobile technology moderately increased engagement among learners, the lack of personalized feedback negatively impacted 25% of the learners. Therefore, the real-time human interaction accorded by synchronous delivery reports higher engagement than asynchronous delivery. Furthermore, the strict scheduling for synchronous delivery makes it less accessible than the self-paced delivery of asynchronous models, which also impacts on scalability, with synchronous models limited by instructor availability and infrastructure unlike asynchronous models which can utilize pre-recorded materials and automated feedback.

With regard to assessment, formative methods that include quizzes, reflective journals, peer reviews, among others, occur continuously during the teaching and learning process (Widiastuti & Saukah, 2024) and can be used to effectively evaluate specific skillsets and critical thinking processes in Information Literacy training (Ball, 2019). Summative methods that include final exams, college entrance exams, final performances, and term papers assessments are used to determine students' level of success or proficiency at the end of segments of instruction (Dixson & Worrell, 2016) and for Information Literacy, can be effective in measuring skills like application of ethical principles in research (Liu & Li, 2025).

Additionally, performance-based assessments evaluate and assess students' skills based on efforts exerted during real-world tasks and strengthen the interrelationship between the students and teachers (Salendab & Dapitanb, 2021). In practice, the use of virtual reality (VR)-based Information Literacy simulations by students in Kazakhstan to navigate databases was effective in enhancing technical and evaluative skills, and recorded 60% higher engagement than traditional methods (Almenara *et al.*, 2022). As such, Lang *et al.* (2017) define Learning Analytics as the collection, analysis, and reporting of data on learner interactions for purposes of optimizing learning and the environments in which it occurs.

Analytics display engagement metrics that track learner interactions, whereby low time spent on tasks indicates cognitive overload (McGuinness & Fulton, 2019), while performance analytics that track assessment scores and data on proficiency or gaps can be used to make curriculum adjustments (Corrall & Jolly, 2022). Additionally, behavioral analytics that track learner interaction with content and learning paths, and data gleaned can be used to improve content navigation, usability and interface design so as to reduce cognitive overload (Liu & Li, 2025).

2.2 Empirical studies

In line with student perceptions and needs, Abdulai *et al.* (2021) who assessed digital literacy and IL proficiency for COVID-19 information searches conducted by 500 online health consumers in Ghana, including 200 university students, showed that whereas digital literacy was high with 65% frequently searching for COVID-19 information, IL skills characterized by ability to evaluate information sources were weak, evidenced by 40% proficiency. And whereas mobile-based IL training increased engagement by 20%, lack of institutional support was cited as a challenge, and 30% of users reported limited connectivity which affected sustainability. Additionally female and rural students showed lower IL proficiency, highlighting inclusivity challenges. This implies that students' perception and needs are influenced by among other factors their proficiency in evaluating information, perceived support from training institution, gender, and area of residence – be it rural or urban.

With regard to technologies used to conduct information literacy, Huang (2024) who conducted a mixed-methods case study with 200 undergraduate students and 10 librarians at Bindura University in Zimbabwe discovered that whereas AI-driven IL tutorials improved critical thinking by 70%, sustainability was challenged by infrastructure costs and limited internet access, with 20% of students unable to access tutorials due to bandwidth issues. And whereas the study piloted offline mobile modules increased access by 30%, technical support to users was inadequate.

Furthermore, developing a framework for conducting effective online information literacy calls for holistic input from stakeholders, particularly students as the intended beneficiaries. Studies from the Global North illustrate that inclusion of gamified content and assessment, use of pilot projects and improvement of infrastructure through partnerships, and use of analytics can achieve

completion rates of up to 85%, improve access to learning materials by 25%, and identify 35% of navigation issues among students (McGuinness & Fulton, 2019; Corral & Jolly, 2022; Liu & Li, 2025). In Africa where infrastructure remains a primary challenge, an empirical study conducted by Eneya *et al.* (2021) to investigate the preparedness of academic libraries in Malawi and South Africa to serve students with disabilities at University of Malawi and University of Zululand respectively revealed inaccessibility of library buildings, lack of materials in alternative formats, lack of assistive technologies, and lack of awareness of library electronic resources by students with disabilities as some of the barriers. The researchers recommended in line with learner-centredness, assignment of staff to assist students with disabilities, while institutionally, they recommended the development of guidelines for service provision to students with disabilities, awareness and sensitisation training for existing as well as all new all staff and technologically, assessment of potential use of special services and determination of priorities for implementation.

2.3 Conceptual framework

This study explored a number of concepts namely; technology-enhancement, information literacy and online.

2.3.1 Technology-enhancement

Technology-enhancement with regard to learning refers to the planned incorporation of digital tools, platforms, and resources to improve the effectiveness, accessibility, engagement, and scalability of educational processes and outcomes. As such, this concept encompasses web-based learning, game-based, computer-based learning environments, the simple usage of animations or computer-generated pictures and movies, and all other possible ways to use technology to enhance the learning or teaching process. In the context of information literacy (IL) training, technology-

enhancement aims to foster skills like accessing, evaluating, and using information ethically, aligning with global standards (ACRL, 2016; UNESCO, 2011; Schweighofer & Ebner, 2015).

2.3.2 Information literacy

Information Literacy (IL) as a concept refers to one's holistic ability to thoughtfully seek out information with an appreciation of how it is produced, before ethically using it to create new knowledge (ACRL, 2016). Furthermore, the concept entails critically thinking of and making balanced judgement about any information one encounters so as to make informed decisions and meaningfully engage with society (CILIP, 2018). According to Kinengyere (2007), the concept of information literacy in addition to good information seeking behaviour involves recognizing when there is an information need and then phrasing questions designed to gather the needed information. It includes evaluating and using information appropriately and ethically once it is retrieved from any media, be it electronic, human or print.

2.3.3 Online

The term online in the context of learning refers to the delivery of educational activities primarily through the internet, enabled by various digital platforms and networks so as to facilitate remote access to instructional materials and assessment tools, as well as instructor-to-learner and learner-to-learner exchanges (Singh & Thurman, 2019). The researchers further posit that online learning includes synchronous formats that include real-time interaction, asynchronous formats that pre-recorded lessons, blog posts, discussion forums, or blended formats that leverage digital tools like learning management systems (LMS), mobile applications among others to enhance interactivity.

2.4 Summary

Information literacy is an essential competence for the twenty-first century and libraries in universities and research institutions in Uganda offer a range of training opportunities for staff and students (Kinengyere, 2007). This literature review has explored the definition, importance, core competencies and of information literacy (IL) as outlined by global governing frameworks. Although technologies such as AI, mobile applications, learning management systems (LMS) and others are facilitating interactive learning, challenges like connectivity and resource constraints persist. Student perceptions and needs vary by gender, discipline, and year-of-study, with gamification, timely feedback and student-centered approaches shown to enhance participation. Pedagogical approaches, including constructivism and connectivism, and a blend of synchronous and asynchronous models support online IL delivery. Frameworks like the ADDIE model, ACRL and SCONUL promote effective designing, delivering, and evaluation of IL programs, while learner-centred, institutional, and technical challenges such as low digital and technical skills, nonexistent policies and limited connectivity respectively as well as opportunities like mobile learning, emerging technologies and open educational resources shape future IL training directions.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter focuses on the presentation of the methods and procedures used to investigate technology-enhanced information literacy training at Makerere University. The chapter sets out the research design, describes the study population, explains how the sample is obtained from the population, describes the sampling techniques, data sources, data collection tools and concludes with the data analysis.

3.1 Research design

A research design is the master plan that specifies strategies developed to seek, explore, and enlist answers to the research problem (Zikmund *et al.*, 2012). The study adopted a fully mixed sequential equal status design that involved mixing both qualitative and quantitative research within one or more of, or across the stages of the research process, with the quantitative and qualitative phases both given approximately equal weight and occurring sequentially (Leech & Onwuegbuzie, 2009). Furthermore, Hashemi and Babaii (2013) note that sequential explanatory designs may be appropriate to the requirements of the studies in which qualitative explanation of the findings from a quantitative phase would be illuminating.

Therefore, a fully mixed sequential equal status explanatory design was adopted for this study to utilize the strength of both quantitative and qualitative research methodology, with the qualitative occurring sequentially after the quantitative, so as to explain findings. As such, the quantitative data was collected from students while qualitative data was collected from the information literacy instructors. Qualitative methods were used to gain an in-depth understanding from the instructors

of the quantitative results obtained from learners on issues affecting information literacy. For this study, field notes were gathered from the interviews with library staff and the audio recordings transcribed verbatim and imported into Microsoft Excel for systematic three-cycle open-axial-thematic coding.

Research Question a: “What are the perceptions and needs of students undertaking information literacy trainings at the Makerere University Library?” was addressed through the quantitative phase, using surveys to capture students’ views on the effectiveness of the current training, facilitator knowledge and support, and desired improvements, providing measurable insights into satisfaction and skill gaps.

Research Question b: “What technologies are used to train students in information literacy at the Makerere University Library?” was examined quantitatively by surveying students on existing tools and supplemented qualitatively through instructor interviews to explain their current state, ease of use, availability, and limitations.

Research Question c: “What guidelines can inform the development of a framework for conducting effective online information literacy trainings for students at the Makerere University Library?” drew on quantitative findings for evidence-based needs and qualitative explanations from instructors to derive practical, context-specific guidelines to inform the proposed framework.

3.2 Framework development approach

The development of the proposed framework for conducting effective online information literacy training at Makerere University Library adopts the ADDIE (Analysis–Design–Development–Implementation–Evaluation) instructional design model (Molenda, 2003). ADDIE was selected

because it offers a practical, evidence-based, and transparent framework for developing sustainable online IL training when adapted as a cyclical, lightweight, mobile-first process (Huang, 2024), which is suitable for the resource-constrained university. Operationalisation of the five phases is proposed as follows.

During the analysis phase, students' information literacy perceptions, needs, skill gaps, preferred delivery modes and existing barriers are identified using surveys for students and interviews for instructors, and during the design phase, learning objectives are defined and mobile-first delivery prioritized, including incorporation of gamification and offline capability using findings from the analysis phase and literature reviewed. At the development phase, a prototype framework is created with components of pedagogy, technology, content and learner support using expert validation from instructors and researchers, while at the implementation phase, proposed rollout strategies covering blended, mobile, partnerships, OER integration are discussed through stakeholder feedback with adherence to timelines and resource requirements. At the evaluation phase, the framework is validated through expert review and member-checking using participant validation and expert ratings.

This iterative process ensures that the final framework is empirically grounded and practically feasible within Makerere's technological and institutional constraints, and aligns with Huang (2024)'s study that successfully used an ADDIE-Artificial Intelligence hybrid to create sustainable digital learning solutions.

3.3 Study population

Population refers to the entire group of people, events, or things of interest that the researcher wishes to investigate (Sekaran & Bougie, 2010). The study population was made up of both

students and staff. The student population was made up of 11,201 participants, a sum of 7,108, 3,609 and 484 undergraduate and postgraduate students who were trained in information literacy during the three-year study period in 2022, 2021 and 2020 respectively as illustrated in Table 1. The staff population is made up of 31 professional library staff (MakLIB, 2023) as broken down in Table 2.

Table 1: Student population trained from 2020 to 2022

YEAR	NUMBER OF STUDENTS TRAINED
2020	484
2021	3,609
2022	7,108
TOTAL	11,201

Source: Researcher's own compilation

Table 2: Professional staff of the university library

DESIGNATION	NUMBER OF STAFF
University Librarian	1
Deputy University Librarian/Associate Professor	1
Senior Librarian	2
Librarian I	19
Systems Administrator 1	1
Librarian II	4
Systems Administrator II	1
Administrative Secretary I	1
TOTAL	31

Source: MakLIB (2023)

3.4 Sample size

A sample size refers to the number of items to be selected from the universe to constitute a sample, and it should be optimum to fulfil the requirements of efficiency, representativeness, reliability and flexibility (Kothari, 2004). This study adopted Krejcie and Morgan's simplified heuristics to determine the sample size. Krejcie and Morgan (1970) recommend a sample size (S) of 375 for a population (N) between 10,000 and 15,000. For the student population of 11,201, a sample size of 375 was appropriate for this study. A total of 15 instructors were considered for the study. These included: 11 College Librarians, one selected from each of the ten colleges and one from the Makerere Institute of Social Research (MISR), and four Librarian II staff from the University Library. The fifteen key informants for the qualitative survey were purposively selected because

the Ten College Librarians and MISR Librarian each serve as the lead trainers of information literacy for students from their respective colleges, assisted by the four Librarian II staff.

3.5 Sampling techniques

Sampling techniques provide a range of methods that enable the researcher to reduce the amount of data you need to collect by considering only data from a subgroup rather than all elements (Saunders *et al.*, 2007). This study employed stratified and purposive sampling techniques. Stratified sampling involves dividing the population into homogenous groups, each group containing subjects with similar characteristics (Cohen *et al.*, 2007). For this study, Stratified sampling was used to categorize the population according to colleges to ensure representation of students from each college.

Purposive sampling was employed to select students who had participated in information literacy training, using registration lists of student cohorts obtained from the Main Library. Additionally, purposive sampling was used to select instructors who formed key informants for qualitative research methodology. Wu and Thompson (2020) note that purposive sampling is one of the non-probability sampling methods whereby the sample is selected based on what the sampler believes to be “typical” or “most representative” of the population. Therefore, a total of fifteen (15) instructors were purposively selected. Ten (10) were College Librarians, one (1) a MISR Librarian and four (4) were Librarian II staff. These were purposively chosen in this study because they interact closely with students by virtue of serving as their trainers of information literacy.

3.6 Data sources

Data was collected from the Makerere University Strategic Plan 2020/21-2024/25, Makerere University Annual Report 2021, Makerere University Library Annual Report 2022 as well as the questionnaires and interviews. Both primary and secondary data were used to enable the collection of accurate, relevant and comprehensive data.

3.6.1 Primary data

Hox and Boeije (2005) define primary data as data that are collected for the specific research problem at hand, using procedures that fit the research problem best. For this study, primary data was gathered using a self-administered questionnaire and an interview guide.

3.6.2 Secondary data

Secondary data on the other hand are data originally collected for a different purpose and reused for another research question (Hox & Boeije, 2005). For this study, secondary data was gathered through comprehensive review of literature that examines technology-enhancement in line with information literacy. The library support system MyLOFT was used to access various online databases such as EBSCOhost, Emerald, JSTOR, Oxford Academic Journals, ProQuest Dissertations & Theses Global, Research4Life, SpringerLink, and Wiley Online Library among others. The Makerere University Strategic Plan 2020/21-2024/25, Makerere University Annual Report 2021 and the Makerere University Library Annual Report 2022 were also used as information sources.

3.7 Data collection instruments

Quantitative data was collected from students using a self-administered structured questionnaire. A questionnaire, by enabling data collection from the respondent in written format can also provide anonymity, thereby encouraging more honest and frank answers (Marshall, 2005) from students compared to other tools such as interviews. Survey questionnaires were composed of multiple-choice questions and Likert scales. Multiple choice questions were used to collect demographic information; while a 5-point Likert scale from 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree to 5 = strongly agree was applied to measure participants' perceptions (Chen, 2011). Nevertheless, qualitative data was collected through personal interview with the fifteen instructors using an interview guide. Interviews are useful for getting a broader understanding of how and why certain things happen and what the opinions, motivations, interests, feelings of the people involved are (Jain, 2021).

3.8 Data analysis

3.8.1 Quantitative data analysis

The quantitative data collected was subjected to statistical analysis using SPSS, which was used to enhance the robustness and generalizability of the findings beyond the sample (DeVellis & Thorpe, 2021). The descriptive analysis was done to show the mean, median, mode, standard deviation and variance, while independent-samples t-tests and one-way ANOVA were performed, with post-hoc tests where applicable, to explore potential differences in perceptions across subgroups by gender, college, or level of study. Google Sheets, a freely available online source was also used to represent results in charts.

3.8.2 Thematic analysis

Thematic analysis was used to deduce the meaning behind the words used by students and facilitators in their responses. Thematic analysis is useful for discovering repeating themes in text. These meaningful themes reveal key insights into data and can be quantified, particularly when paired with sentiment analysis (Schutt & Chambliss, 2013). For this study, field notes were gathered from the interviews with library staff and the audio recordings transcribed verbatim and imported into Microsoft Excel for systematic coding. The first-cycle open coding identified initial concepts (e.g., “poor internet,” “obsolete equipment”), followed by axial coding to group related codes into categories (e.g., “infrastructure barriers,” “preferred delivery modes”), and finally thematic coding to derive overarching themes (e.g., “technology constraints,” “learner-centered needs”) that directly informed the proposed online IL framework.

3.9 Reliability

Reliability is the degree to which a measure is free from random error and therefore gives consistent results (Khalid *et al.*, 2012). Furthermore, it indicates the extent to which a questionnaire produces consistent results under similar circumstances, free from measurement error (Creswell & Creswell, 2017). Analysis was done using SPSS to calculate Cronbach’s alpha so as to measure reliability of instrument developed. This choice is informed by the view that Cronbach’s alpha is the most widely used objective measure of reliability (Vehkalahti *et al.*, 2006; Tavakol & Dennick, 2011; Bonett & Wright, 2015).

Specifically internal consistency reliability, which is used to assesses the consistency of items within a questionnaire that measure the same construct (DeVellis & Thorpe, 2021) was measured for the seventeen Likert-scale items. The items evaluated students’ perceptions of Information

Literacy Training, focusing on technology usability (1 = Strongly disagree, 5 = Strongly agree), and accessibility (1 = Not accessible, 5 = Very accessible), information competence (1 = Strongly disagree, 5 = Strongly agree), facilitator support (1 = Strongly disagree, 5 = Strongly agree), and overall training experience (1 = Not helpful, 5 = Extremely helpful). Items were further grouped into three subscales based on theoretical alignment: (a) Technology Usability (6 items), (b) Information Competence (4 items), and (c) Facilitator Support and Training Value (7 items) to ensure construct-specific reliability.

According to DeVellis and Thorpe (2021), value of .70 or higher indicates acceptable reliability, while .80 or higher indicates good reliability. Cronbach's alpha for the Technology Usability subscale (6 items) was .82 (N = 196), indicating good internal consistency, while that for the Information Competence subscale (4 items) .78 (N = 196), indicating acceptable reliability. The Facilitator Support and Training Value subscale (7 items) had a Cronbach's alpha of .85 (N = 196), indicating very good internal consistency reliability.

3.10 Validity

Validity is the extent to which a score truthfully represents a concept (Khalid *et al.*, 2012). Face validity, which assesses whether the questionnaire appears to measure the intended construct, and has been shown to enhance the engagement of respondents (Creswell & Creswell, 2017) was conducted by content validity whereby three instructors of information literacy reviewed the questionnaire items for relevance and ensuring that they covered the topic adequately. Additionally, face validity was used whereby the questionnaire was piloted with students to ensure that questions were clear and actually elicited the responses the research intended to find out.

3.11 Ethical concerns

Information that introduced the researcher was presented to all participants in the data collection process prior to any data collection. Informed consent of respondents was built into the data collection tool and sought during personal interviews before the study was undertaken. Participants were requested to agree to take part in the study voluntarily. This was achieved by incorporating a step at the beginning of the self-administered questionnaire via Google Forms whereby the respondent could not proceed to fill the instrument unless they consented by clicking the appropriate response. The information provided by the participants was kept confidential and anonymous for ethical reasons.

CHAPTER FOUR

PRESENTATION AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents the analysis and interpretation of findings. The chapter is made up of six sections. It addresses the three research objectives namely; to explore the perceptions and needs of students undertaking information literacy trainings at the Makerere University Library, to establish the technologies used to conduct information literacy trainings for students at the Makerere University Library, and to develop a framework for conducting effective online information literacy trainings at the Makerere University Library. This study involved both students and instructors at Makerere University. Their responses and insights are presented through tables and figures, with detailed explanations provided in the discussion that follows.

4.1 Presentation of the response rate

The response rate is considered to be an indication of the number of responses acquired relative to the total number that was targeted.

Table 3: Response rate to questionnaires

	Administered	Not responded to	Completed	Response Rate
Students	375	179	196	52.3
Instructors	15	0	15	100
Total	390	179	211	79.7 (Averaged)

Source: Field Data

Table 3 above indicates that the response rate was 79.7% overall for the study and each of the categories had a response rate of at least 50%. Wimmer and Dominick (2013) from their research denote response rate ranges between 5% and 80% as acceptable for internet-based surveys. Furthermore, Holtom *et al.* (2022) argue that response rates can be used to produce valid conclusions if respondents are demonstrated to be representative of a broader population based on relevant characteristics. The 211 respondents in this study were representative of the students and instructors.

4.2 Demographics of the participants

The demographics give a better understanding of who the participants in the study are. The demographics of the participants includes their sex, age range, current academic programme, college and year of training.

4.2.1 Gender of the participants

Both male and female participants took part in this study as presented in Table 4.

Table 4: Gender of participants

Category	Instructors		Students		Overall	
	Male	Female	Male	Female	Male	Female
Number	4	11	108	88	112	99
Percentage	26.7	73.3	55.1	44.9	53.1	46.9
Total	15		196		211	

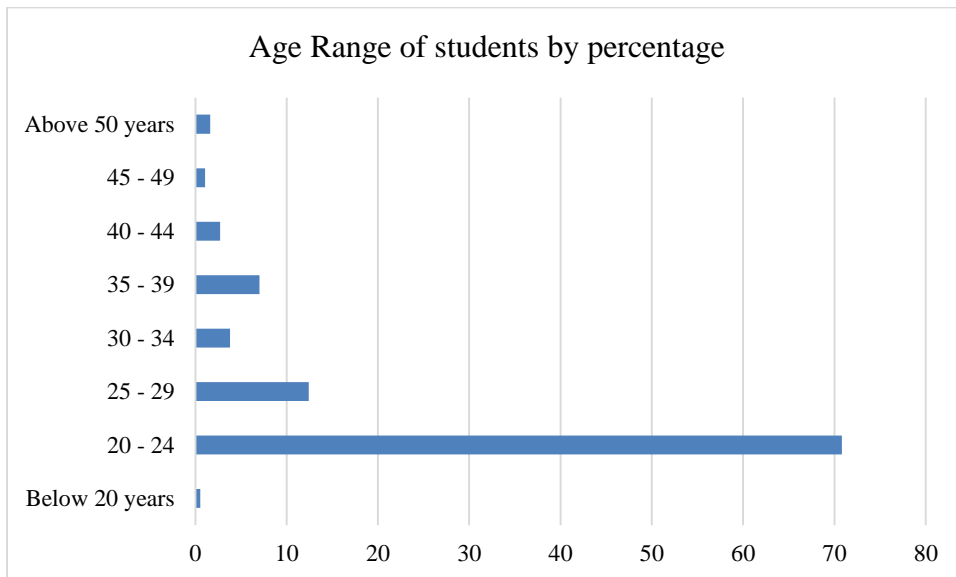
Source: Field Data

From Table 4, overall, most of the respondents were male (53.1%) and the females comprised 46.9% of the sample. The study was therefore not biased with regard to the gender of respondents, and therefore the findings were balanced in that sense.

4.2.2 Age range of students

Determining the age range of students was aimed at understanding whether age had an influence on their perceptions of technology and its enhancement of learning.

Figure 1: Age range of students



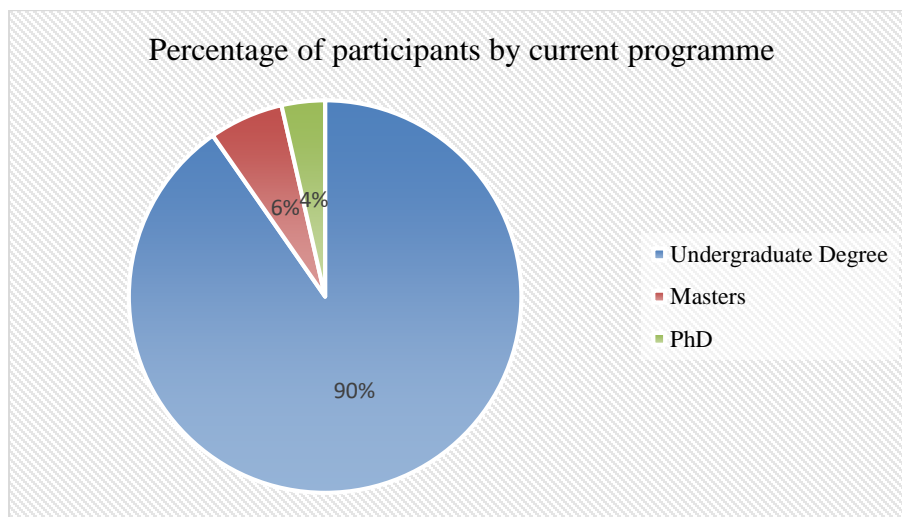
Source: Field data

As depicted by Figure 1, the Majority (70.9%) of students were aged between 20 to 24 years, while the minority (0.5%) were aged below 20 years. 13.3% of students were aged between 25 to 29 years, 3.6% aged between 30 to 34 years, 6.6% aged between 35 to 39 years, 2.6% aged between 40 to 44 years, 1% aged between 45 to 49 years and 1.5% aged above 50 years. This distribution is in line with the student population whereby majority of the students are undergraduate and are aged below 30 years, and the minority are graduate students (Mak, 2022a).

4.2.3 Current academic programme of students

Understanding the current academic programme of students was aimed at appreciating if their attitudes at various levels of study influenced their perception of technology use in information literacy training.

Figure 2: Participants by current programme



Source: Field Data

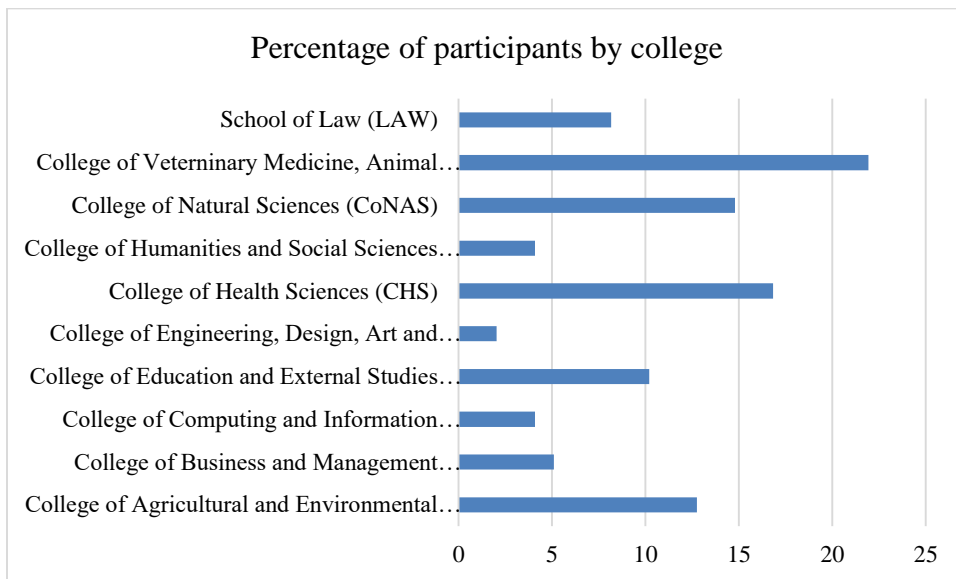
Figure 2 illustrates that the majority (90%) of participants were undergraduate students while the minority (10%) were graduate students (Masters 6% and PhD 4%). This distribution is in line with the student population whereby majority of the students are undergraduate and the minority are PhD students (Mak, 2022a).

4.2.4 Colleges of participants

Students were asked to declare the college to ensure that all constituent academic units at the university were represented in the assessment of how technology can be used to enhance information literacy training. Student responses were received from all ten colleges namely;

College of Agricultural and Environmental Sciences (CAES), College of Business and Management Sciences (CoBAMS), College of Computing and Information Sciences (CoCIS), College of Education and External Studies (CEES), College of Engineering, Design, Art and Technology (CEDAT), College of Health Sciences (CHS), College of Humanities and Social Sciences (CHUSS), College of Natural Sciences (CoNAS), College of Veterinary Medicine, Animal Resources and Biosecurity (CoVAB), and School of Law (LAW).

Figure 3: Participants by college



Source: Field data

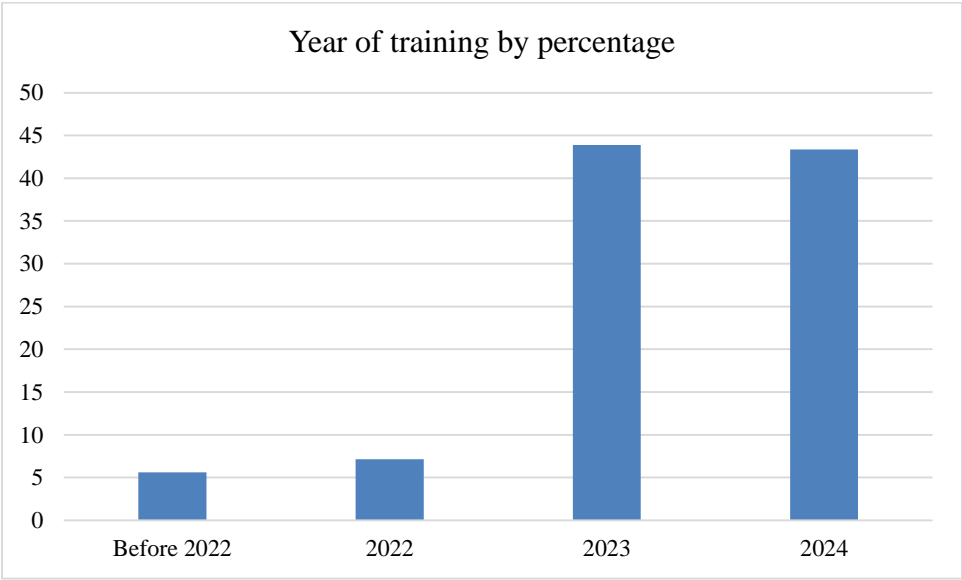
As seen in Figure 3, majority of respondents at 21.9% were from the College of Veterinary Medicine, Animal Resources and Biosecurity (CoVAB), followed by the College Health Sciences (CHS) at 16.8%, College of Natural Sciences (CoNAS) at 14.8%, College of Agricultural and Environmental Sciences (CAES) at 12.8%, College of Education and External Studies (CEES) at 10.2%, School of Law (LAW) at 8.2%, College of Business and Management Sciences (CoBAMS) at 5.1%, College of Computing and Information Sciences (CoCIS) and College of Humanities and

Social Sciences (CHUSS) both at 4.1%, while the least percentage of respondents (2.0%) were from the College of Engineering, Design, Art and Technology (CEDAT). This distribution, though representative of all colleges, was higher in colleges where student class representatives were keen to share the questionnaire with their cohorts.

4.2.5 Year that participants undertook training

Determining the year students undertook information literacy training was meant to corroborate if the numbers of those trained indeed increased by year as reported in Library Annual Report of 2022.

Figure 4: Year that Participants Undertook Training



Source: Field data

According to Figure 4, an almost equal percentage 43.8% and 43.4% of participants reported undertaking training in 2023 and 2024 respectively, while 7.1% reported undertaking training in 2022 and the minority (5.6%) reported training before 2022. This implies that follow-up on students needs to be undertaken immediately after information literacy training is undertaken

because as years progress, students do not find it necessary or relevant to respond to questionnaires and the few that do may not accurately recall specific components of training.

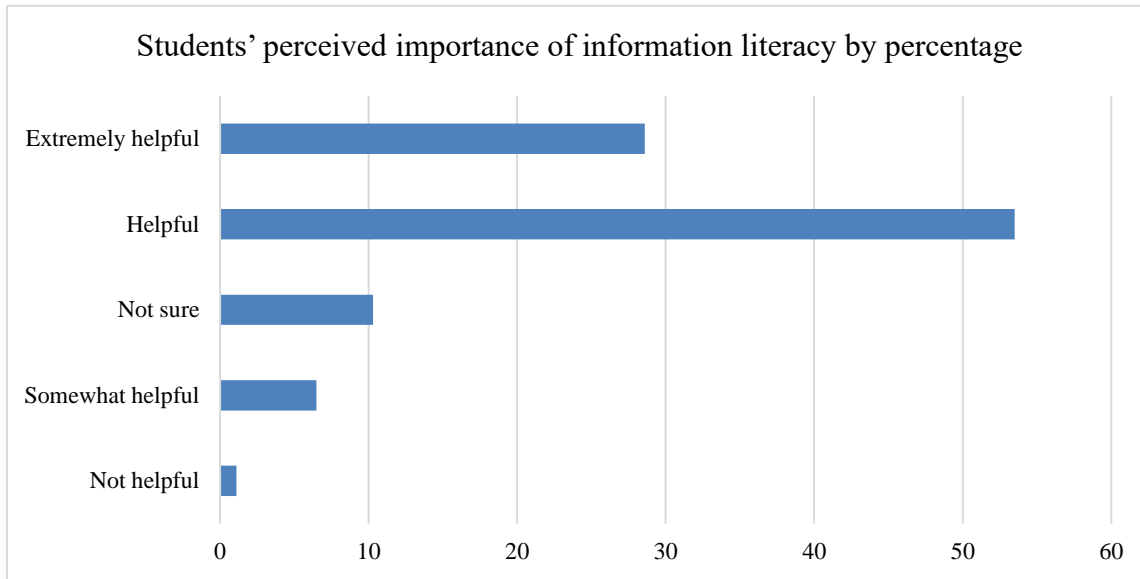
4.3 Information literacy training perceptions and needs

Perceptions of students undertaking Information Literacy Training are an important indicator of whether or not it contributes to attainment their academic goals (Yevelson-Shorsher & Bronstein, 2018). This study examined students' perceptions by focusing on their overall experience, memorable aspects, and skills gained in recognizing, locating, evaluating, and using information for assignments. It also assessed the sufficiency of training time, technology accessibility and navigation, and their impact on learning. Additionally, it evaluated facilitator support, training importance, and students' willingness to recommend or pursue further training.

4.3.1 Perceived importance of information literacy for academic success

Asking the students to rate the training was aimed at establishing if they found it helpful or not helpful to their academic life. A 5-point Likert scale from 1 = not helpful, 2 = somewhat helpful, 3 = not sure, 4 = helpful to 5 = extremely helpful was used to determine respondents' overall rating of the training.

Figure 5: Students’ perceived importance of information literacy



Source: Field data

As illustrated in Figure 5, the majority 54.1% and 28.1% of respondents rated the training as helpful and extremely helpful respectively. And whereas 9.7% of respondents were not sure if the training was helpful or not, 7.1% rated the training as somewhat helpful, while 1% rated the training as not helpful. This implies that majority of students consider information literacy training as a contributor to improving their research skills and making use of library resources.

Responses by facilitators

In line with responses by students, facilitator F in his interview response concurred that Information Literacy Training is very crucial:

“It is very relevant. Information Literacy contributes significantly to users’ research output”

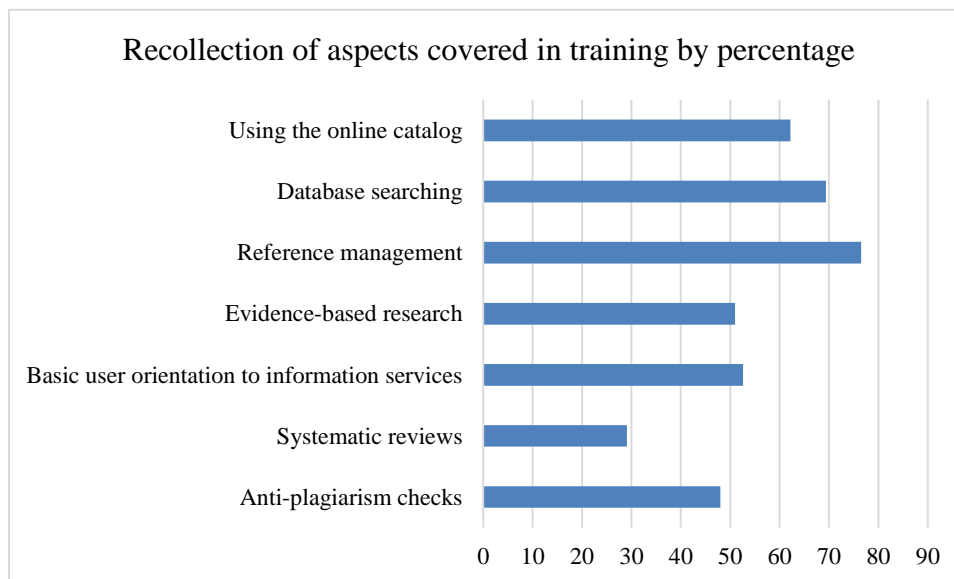
Facilitator G in his interview response equally underscored the importance of the training:

“I think this information literacy is very vital and crucial, and has to be started as soon as possible. I can say I went through undergraduate without attending an information literacy training but it came back to bite; I really felt it when I went to do my Masters”.

4.3.2 Recollection of aspects of information literacy covered

Information Literacy Training is designed to cover aspects such as; using the online catalog, database searching, reference management, evidence-based research, basic user orientation to information services, systematic reviews, anti-plagiarism checks and acquaints users on use of library support systems such as MyLOFT, Endnote, Virtua and Libhub. Establishing what students recall is important for refining future trainings.

Figure 6: Recollection of aspects covered in training by percentage



Source: Field data

As seen in Figure 6, the most recalled aspects were; reference management, database searching, and using the online catalog as reported by 76.5%, 69.4% and 62.2% of respondents respectively.

The least recalled aspect was systematic reviews at 29.1%. Percentages exceed 100% because participants had the option to select multiple choices of aspects covered by the training. Results imply that students are more likely to recall aspects of training that they practice, as exemplified by reference management, database searching and using the online catalog registering the highest percentages.

Responses by facilitators

Similar to findings from students, facilitator J in his interview response reported that training in reference management and anti-plagiarism checks holds the key to empowering students to effectively use information.

“We teach you how to use the information for example using the reference tools; that’s part of using information effectively. We also have plagiarism training, you have to make sure that whatever you do, you have to reference it to minimize your chances of being penalized.”

Additionally, facilitator H in her interview response concurred that:

“For effectively using the information, if you don’t add ethically, there is no way you are going to do it ethically. That one, we mostly deal with plagiarism detectors, then we also use citation managers like Endnote and Mendeley.”

Database searching, another aspect reported by students, was addressed by facilitator N who in her interview response noted that:

“We have the different databases we subscribe to, and these databases have got support systems to enable seamless access to these resources. We also have access

to Open Access Resources, which we have made available on the MyLOFT (My Library on Finger Tips) platform.”

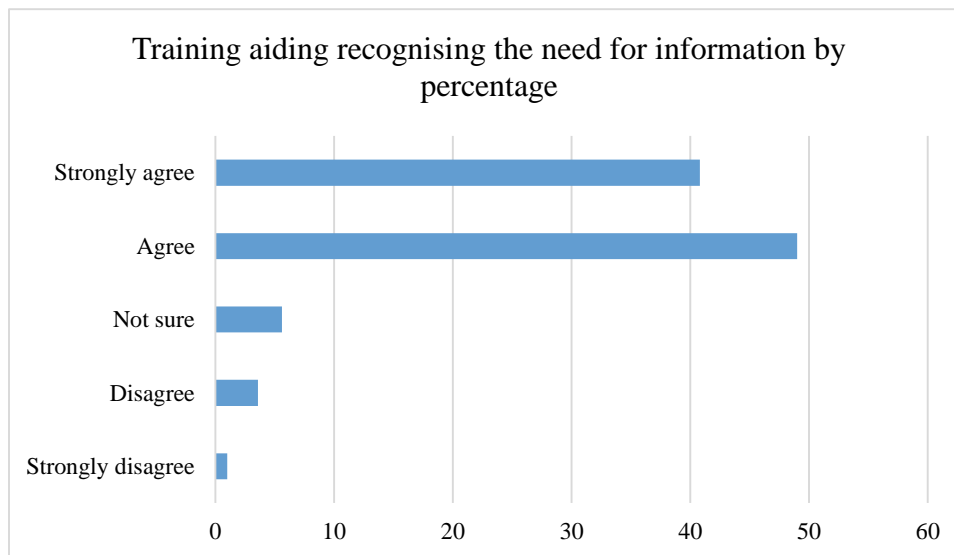
4.3.3 Students’ current levels of information literacy

Students’ current levels of information literacy were evaluated based on how well they perceived the training’s impact on helping them recognize the need for information, locate the required information, evaluate the located information and effectively use the information.

4.3.3.1 Recognising the need for information

Determining how the training helped students recognize the need for information is the basis for establishing whether students can go on to grasp other aspects of information literacy training.

Figure 7: Training aiding recognising the need for information



Source: Field data

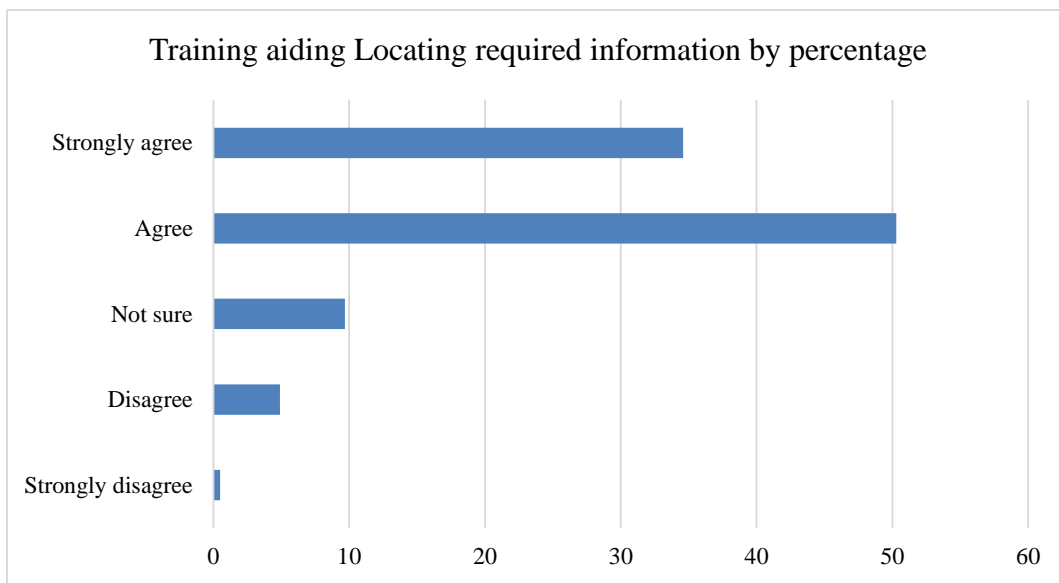
As shown in Figure 7, the majority, 49% and 40.8% of respondents agreed and strongly agreed respectively that the training helped them recognize the need for information in their academics.

A small percentage, 5.6% were not sure, while 3.6% disagreed and 1% strongly disagreed that training enabled them to recognize the need for information. Results imply that majority of students are in agreement that the foundation of information literacy is recognizing the need and will go on to master the other aspects of training.

4.3.3.2 Locating the required for information

Establishing if the training equipped students with skills to locate the information they required is another measure of how well they grasp basic aspects of information literacy training.

Figure 8: Training aiding locating required information



Source: Field data

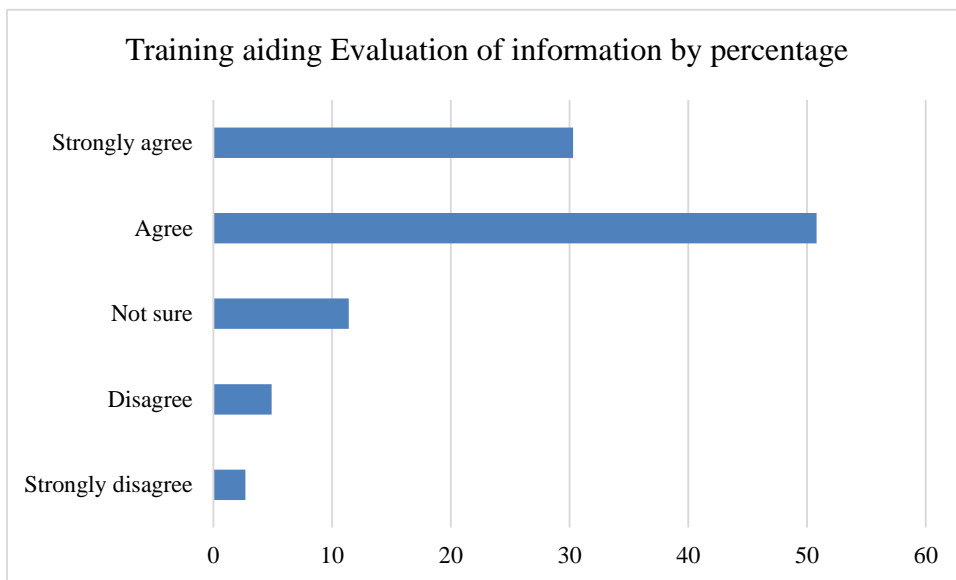
As seen in Figure 8, most of the students either agreed (51.5%) or strongly agreed (33.7%) that the training enabled them to locate the required information. 9.2% reported not being sure, while 5.1% and 0.5% of respondents disagreed and strongly disagreed respectively that the training equipped them to locate information. The majority of students agreeing that the training equipped them to

locate information indicates that they have the ability to distinguish between authentic and non-authentic sources.

4.3.3.3 Evaluating the located information

Beyond the ability to locate information, establishing if the training equipped students with skills to evaluate the information located is important to measure if higher order skills are being gained.

Figure 9: Training aiding evaluation of information



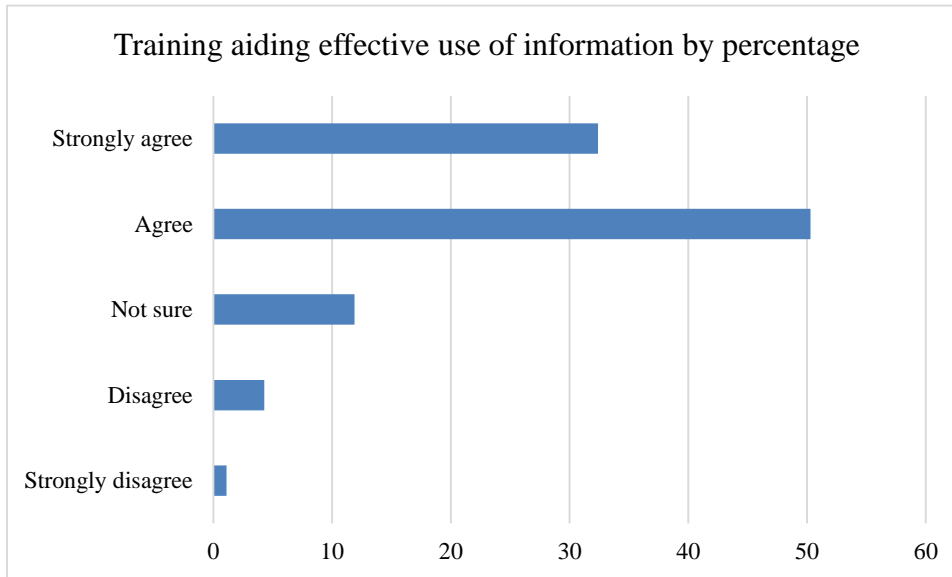
Source: Field data

As shown by Figure 9, majority 51% and 30.1% agreed and strongly agreed respectively that the training enabled them to evaluate information. On the other hand, 11.2% were not sure, while 5.1% disagreed and 2.6% strongly disagreed that the training equipped them with skills to evaluate information. This implies that beyond locating the information, the majority of students found the training relevant in terms of equipping them to ascertain what information was relevant to their topic and what was not.

4.3.3.4 Effectively using the information

Evaluating if the training enabled students to effectively use information is aimed at establishing if they can translate the knowledge acquired into practice.

Figure 10: Training aiding effective use of information



Source: Field data

As illustrated by Figure 10, whereas 51% and 31.6% of respondents agreed and strongly agreed respectively that the training enabled them to effectively use information, 11.7% were not sure and 4.6% disagreed. On the other hand, 1% strongly disagreed that the training enabled them to effectively use information to write their assignments. Results imply that the majority of students who took part in the training were equipped with skills to not only come up with well-researched work but were also able to ethically use information by correctly citing their sources.

Responses by facilitators

Facilitators were asked to rate students' competence using the scale; Highly Competent, Competent, Somewhat competent and Not competent, with regard to aspects of recognising the need for information, locating it, evaluating it and effectively using it. Contrary to majority of students who either agreed or strongly agreed that the training greatly aided them in these four aspects, facilitator D in her interview response noted that:

“For undergraduate students, I would rate them as not competent. When it comes to finding information all they know is how to go to Google and key in. The graduate students and the undergraduate that have reached third, fourth and fifth year, when they write those dissertations, they are a bit brightened up and I could say they are Somewhat Competent.”

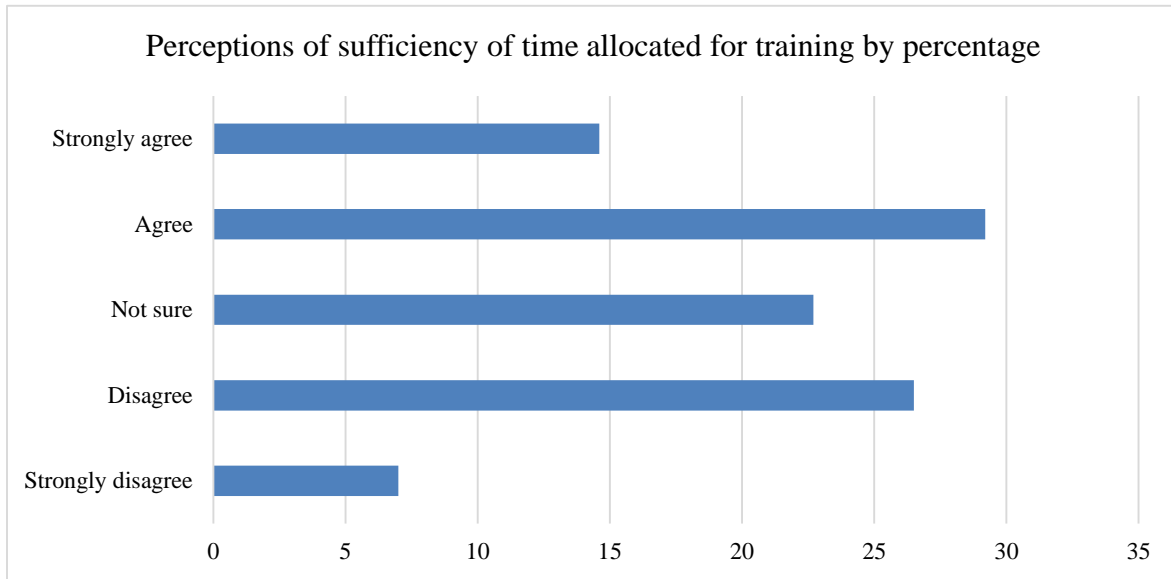
However, facilitator L in her interview response concurred with students noting that:

“I think 70% have adapted to usage of electronic resources. Utilization is good. So, 70% implies that they are competent.”

4.3.4 Time allocated for training

Establishing if the time allocated for training was sufficient or not is important to evaluate if the amount of content is equivalent or too much for each session.

Figure 11: Perceptions of sufficiency of time allocated for training



Source: Field data

As illustrated in Figure 11, whereas 29.1% of respondents agreed that the time allocated was sufficient, 27% disagreed, and 21.4% were not sure. On the other hand, 14.8% of respondents strongly agreed that the time allocated was sufficient, while 7.7% strongly disagreed.

Responses by facilitators

Facilitators observed that the lack of ICT skills were a major hindrance to conducting training within time allocated. Facilitator B in her interview response noted that:

“They are some who did not study computer literacy at all and they have come in and are seeing it for the first time in the University. So, if you get a class that is tech savvy, that is the best. You will not even take a lot of time; you will even enjoy. So, you find that you are in information literacy but you also have to teach IT skills.”

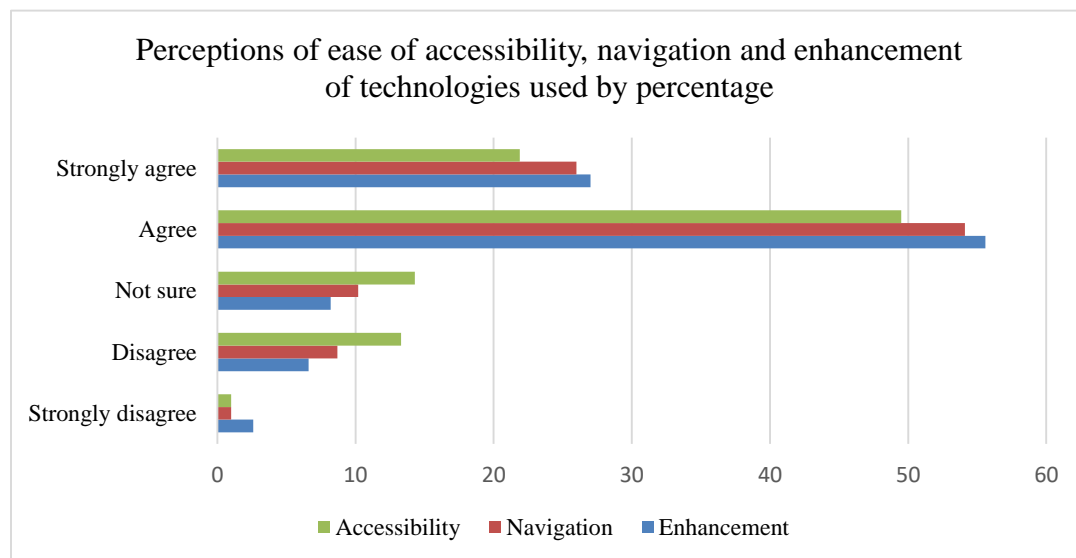
Similarly, facilitator I in her interview response observed:

“We lose a lot of time; out of the two-hour session, an entire hour can be spent on helping users with ICT-related tasks. One time a first year asked me what the difference is between an email and a website.”

4.3.5 Accessibility, ease of use, and enhancement of training by technologies used

In order to evaluate if technologies used aided or didn't aid training, it was important to establish how accessible and easy to navigate they were to the respondents as well as if they enhanced the experience.

Figure 12: Perceptions of ease of accessibility, navigation and enhancement by technologies



Source: Field data

Figure 12 illustrates that the majority 49.5% and 21.9% of respondents agreed and strongly agreed respectively that the technologies were easily accessible. And whereas 13.3% disagreed, 4.3% were not sure and 1% strongly disagreed that the technologies were accessible. Additionally, the majority 54.1% and 26% of respondents agreed and strongly agreed respectively that the

technologies were easy to navigate. And whereas 10.2% of respondents were not sure and 8.7% disagreed, 1% strongly disagreed that the technologies were easy to navigate. Furthermore, 55.6% and 27% of respondents agreed and strongly agreed respectively that technologies enhanced their learning experience. And whereas 8.2% of respondents were not sure, 6.6% and 2.6% disagreed and strongly disagreed that technologies used enhanced the training. Results indicating that the majority of respondents found the technologies easily accessible, easy to navigate and that they enhanced their learning experience could be attributed to the high reported use, during training, of personal laptops and mobile phones which they interact with often.

Responses by facilitators

Whereas the majority of students either agreed or strongly agreed that the technologies were accessible, easy to navigate and enhanced training, facilitator N in her interview response on the other hand noted that technologies were insufficient and obsolete:

“We also have a computer lab, which has few computers as many of them have become obsolete because Makerere University is implementing a policy on access whereby we are no longer budgeting for computers. For a long time, we have not been buying computers in the Library because Wi-Fi connectivity has been provided in all places and it is assumed that students should purchase computers on loan. However, this is not the case, these students need the computers and their shortage affects our Information Literacy Training activities. Because some have gadgets that have limited space, are outdated and are slow. And because these resources are constantly being updated, they don’t work on certain gadgets. For

example, the MyLOFT app does not work on models below iPhone 12 or Android 8 and below.”

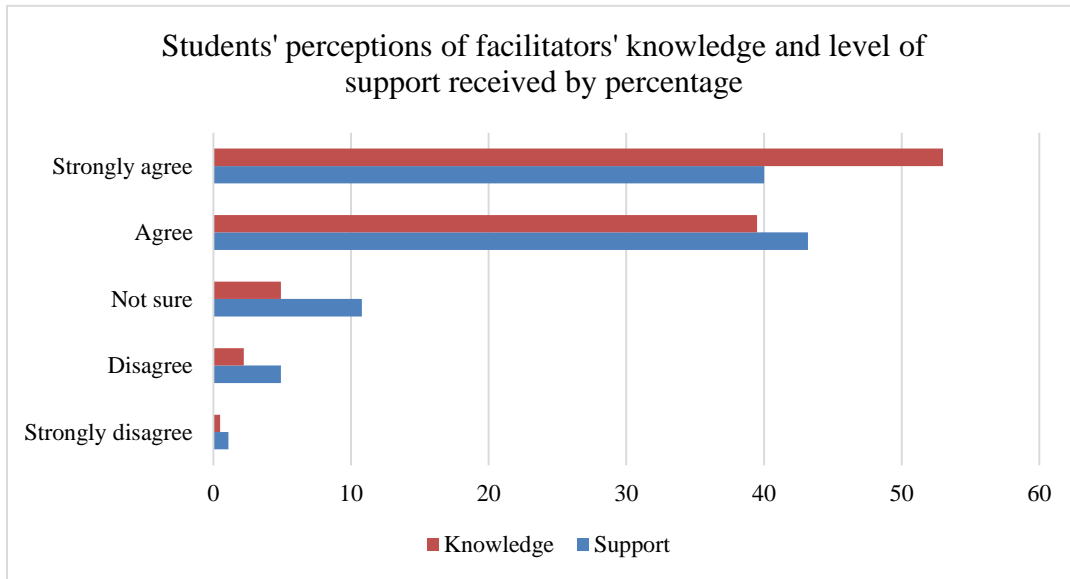
Facilitator G in his interview response noted that accessibility of some technologies does not necessarily translate into ease of navigation or enhancement:

“The undergraduates have the deficiency of the phone. They want to use the phone all the time and yet they don’t know how to manipulate the phone. Sometimes you ask them to log into their email on the computer and they do not know, because they are accustomed to using an App for everything. The deficiencies of Apps; I remember someone was trying to create a password and we took almost 10 minutes on the computer, they kept on making mistakes. The mobile phone has become a good alternative but it is making them lose touch of how to use the laptops.”

4.3.6 Knowledge of facilitators and support rendered

Establishing the perceptions of respondents on how knowledgeable facilitators are and the level of support they received from them during training is important for it greatly contributes to the appreciation of the importance of information literacy training.

Figure 13: Students' perceptions of facilitators' knowledge and level of support received



Source: Field data

As seen in Figure 13, whereas the majority, 52% and 39.3% of respondents strongly agreed and agreed respectively that facilitators were knowledgeable, 5.1% were not sure and 3.1% disagreed. On the other hand, 0.5% strongly disagreed that facilitators were knowledgeable. Additionally, whereas 43.4% and 38.3% of respondents agreed and strongly agreed respectively that they received enough support from facilitators during training, 11.2% were not sure, and 6.1% disagreed. On the other hand, 1% of respondents strongly disagreed that they received enough support from facilitators during training. Results imply that respondents were able to trust and depend on the skills the facilitators were passing on to them and the support rendered during training was a good way to ensure engagement and participation during training.

Responses by facilitators

In agreement with responses from majority of students who either agreed or strongly agreed that facilitators were knowledgeable and accorded them support during training, facilitator B in her interview response touched on the need to exercise confidence:

“If I am going to use any technology, I first teach it to myself and most of these things are online on YouTube. I hate embarrassments and being an instructor, you have to be confident because if you are not, even the people start doubting you and they might say is this person really giving us...? So, you must be confident so that they also gain that trust in learning.”

Similarly, facilitator L in her interview response concurred that students are encouraged to seek help:

“When you sit them down and teach them hands-on as the trainings have been going on, they cope. And we tell them that if they have not understood well, they should always come back to us because sometimes we have limited time. When you have a class of 50-100, not all of them will grasp at once.”

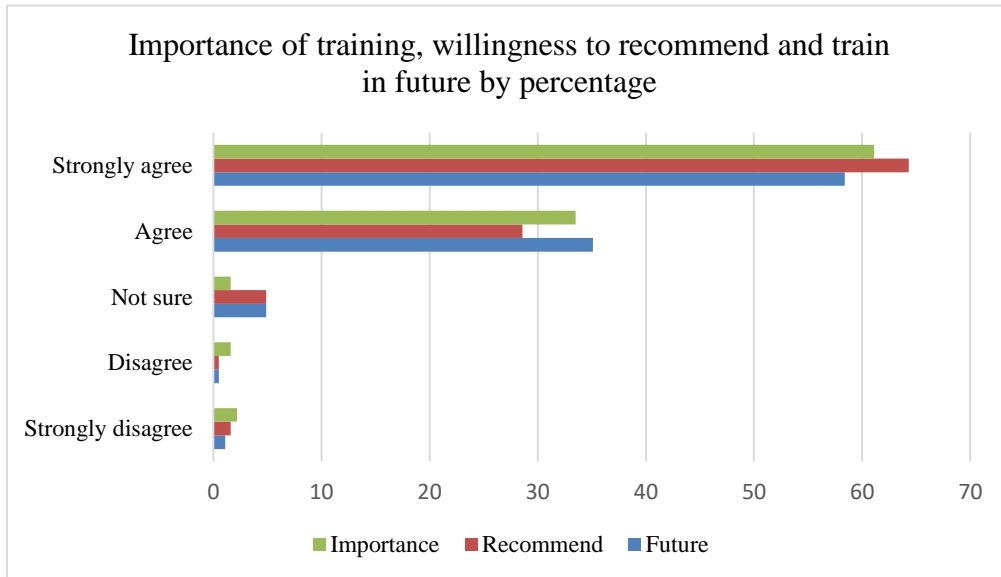
Nevertheless, facilitator D in her interview response noted that not all trainers are confident or motivated:

“Librarians on top of lacking confidence are also demotivated. For example, they feel like it is additional work to them, it is extra load. There is also technophobia. We have librarians who are old in age and conservative. They feel the way things were done is the way things should be done. Should you bring something new, they will say don't add extra work to us.”

4.3.7 Importance of information literacy, participation in current, and future training

Ascertaining the importance of information literacy training to students offers insights into how much value they attach to lifelong learning.

Figure 14: Importance of training, willingness to recommend, and train in future



Source: Field data

As illustrated by Figure 14, whereas 59.2% and 35.2% of respondents strongly agreed and agreed respectively that information literacy is important to their academics and future career, 1.5% were not sure, 2% disagreed, and a similar percentage (2%) strongly disagreed. Furthermore, whereas the majority, 62.8% and 30.1% strongly agreed and agreed respectively that they would be willing to recommend the training to peers, 4.6% were not sure, while 1% disagreed and 1.5% strongly disagreed that they would be willing. Similarly, whereas the majority 57.7% and 35.7% strongly agreed and agreed respectively that they would be willing to participate in future trainings, 4.6% were not sure. On the other hand, 0.5% disagreed and 1.5% strongly disagreed that they would be willing to participate in future trainings. Results indicating that the majority of respondents agreed

that information literacy training is important to their academics and that they would be willing to recommend the training to peers and participate in future instances implies that they value the skills gained as important for lifelong learning.

Responses by facilitators

Interview responses from facilitators on the importance of information literacy were in agreement with findings from students' responses. Sharing from personal experience, facilitator C in her interview response observed:

“It is one of the most important things. I personally saw it in my life. You can imagine I saw the importance of it when I was a Masters student. I was already working as Librarian and so you can imagine that is how bad it is, if we library staff don't even know it, not until we become students.”

Similarly, facilitator M in her interview response concurred that:

“I think it's the way to go, because if they have to do research, they definitely have to know how to access the research. Someone would say you can go to Google and get the stuff but there are also peer reviewed papers. When you are just coming and you haven't been told, you wouldn't know which are the peer reviewed papers, where can I access them from? Who authors them? So, unless you attend these information literacy classes, you don't get that information”

Additionally, facilitator B in her interview response noted that it is a basic skill that ought to be learned:

“It is the first skill that is needed for any student, be it at undergrad or postgrad, even the staff themselves. Why? Because with information literacy, you will be able to get resources you need either to teach, resources to use in your research or your coursework. And information literacy also will give you skills either on how to write best, because we do teach them how to write, how to paraphrase, those things that at times lecturers do not teach.”

4.3.8 Challenges faced by students in accessing and using information resources

Students were asked to describe challenges that they faced during information literacy training, and how those challenges can be addressed. Responses were extracted from Google Form; the data was cleaned, coded and learner needs derived from proposed actions.

Table 5: Learner challenges and proposed actions

Components	Description	Example Quotes	Proposed actions
Duration, Scheduling and Frequency of training	Time allocated, timing versus year of study, and number of times information literacy training is conducted	<p>“A one-day thing and questions were many yet time was little”</p> <p>“Insufficient time for the session because we had a lecture”</p> <p>“I feel like we did the training late in year three towards the end”</p>	<p>“Adding it to the curriculum for longer interaction”</p> <p>“Course should be introduced earlier like first year”</p> <p>“Provide flexible, self-paced online modules that learners</p>

		“The course was hard to timetable for the whole department”	can complete on their own schedule.”
Digital Skills	Proficiency of learners at using technology	“Challenge of installing endnote on the computer” “Computer keys were very challenging to manipulate” “I was not competent with my computer skill so most times I could lag behind”	“Offer technical support and step-by-step tutorials for using digital tools and platforms, ensuring that all learners can participate fully”
Perceived Satisfaction with Pedagogical aspects	Perception of instructors’ ability to impart theory and practice of content taught	“Instructors were very fast at some point and yet most of these applications were new to us” “The trainers were not going in-depth” “The extreme iron hand of the facilitator”	“Pair learners with mentors who can provide feedback and guidance on applying information literacy skills in real-world contexts.” “It has to be a step by step with options of video guidelines and tutorials”
Instructor support	Perception of instructor-	“We were a big number so not all of us got assistance”	“The course should be timetabled throughout

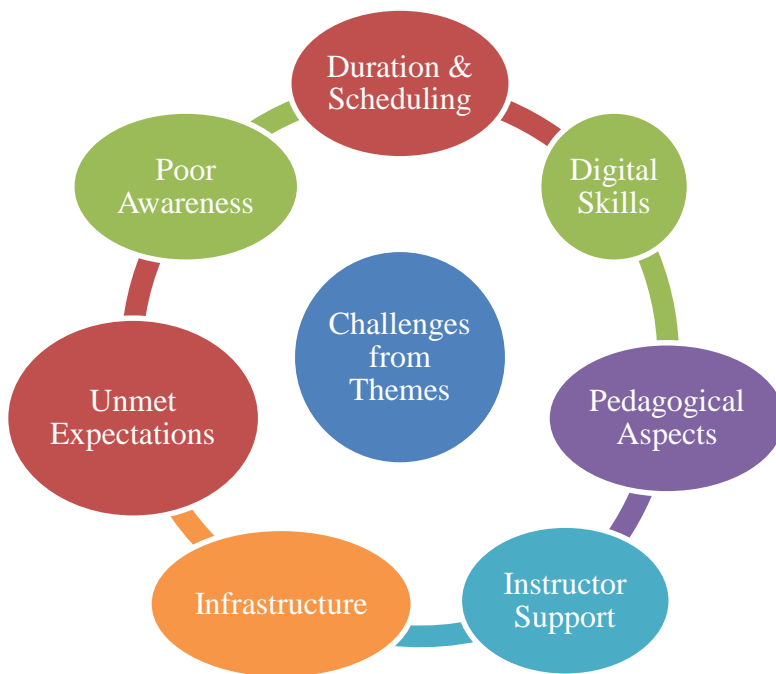
	<p>student interaction and support received</p>	<p>“Three trainers could not sustain the large number of trainees”</p> <p>“Teacher student ratio was not good so you had to wait for long to get assistance”</p>	<p>the semester so that the training is carried out at the college”</p> <p>“allowing active participation with guidance from the trainers”</p>
<p>Infrastructure and Technological aspects</p>	<p>Perception of infrastructure in place to support training</p>	<p>“The Library Computers were not sufficient for users who didn't have personal laptops or phones”</p> <p>“Getting the software requires one to visit the Main Library and College Library a couple of times”</p> <p>“Few computers and spoilt, Wi-Fi was slow people used own data, inconvenient”</p> <p>“Power outages are a problem”</p> <p>“Endnote was heavy for most laptops it made my computer to slow down”</p>	<p>“Make software more easily available. It could be uploaded on the website without having to go the library”</p> <p>“We need more computers and laptops in the lab”</p>

<p>Learner Needs and Expectations</p>	<p>Skills students required and preferred formats for learning content</p>	<p>“I needed more help on how to cite research” “The training equipped us with ability on how to find information but not how to put it down”</p>	<p>“pre-training surveys or other situational analysis to ascertain the participants' levels of proficiency so to package appropriately” “Use videos, quizzes, infographics, and interactive exercises to enhance engagement, Provide hands-on practice with databases, citation tools, and AI research assistants.”</p>
<p>Awareness of training</p>	<p>Perception of prior notice or publicity of training</p>	<p>“We were informed very late only a day to the programme” “Poor scheduling and communication for the trainings”</p>	<p>“The courses should be announced way beforehand so that people can prepare”</p>

Source: Field data

Table 5 above summarises the components identified through thematic analysis of qualitative responses collected from students in respect of the challenges faced during information literacy training and how those challenges can be addressed.

Figure 15: Challenges derived from components



Source: Field data

As illustrated in Figure 15 above, challenges faced included insufficient time and inconvenient scheduling of training, inability to install required software and keep pace with instructor due to poor computer use skills, high student-to-instructor ratios exacerbated by fast-paced teaching and no deep dives into content, inadequate numbers of computers, slow internet connections, power outages and low-resourced personal devices, unmet intended learning objectives, and late communication of trainings.

4.3.9 Skills gaps and competencies required

Results show that students are desirous of attaining skills in citation, how to evaluate and use the sources acquired, and hands-on practice with using databases. Students proposed that formats such as video tutorials, quizzes, info graphics, interactive exercises, and use of AI research assistants should be adopted to make learning more engaging. Furthermore, integrating information literacy training into the curriculum, offering flexible online modules, and providing technical support with step-by-step tutorials were proposed in addition to inclusion of mentoring, and making software accessible. Pre-training surveys and increased lab resources in the form of computers and training tailored to participants' proficiency levels were proposed to enhance engagement.

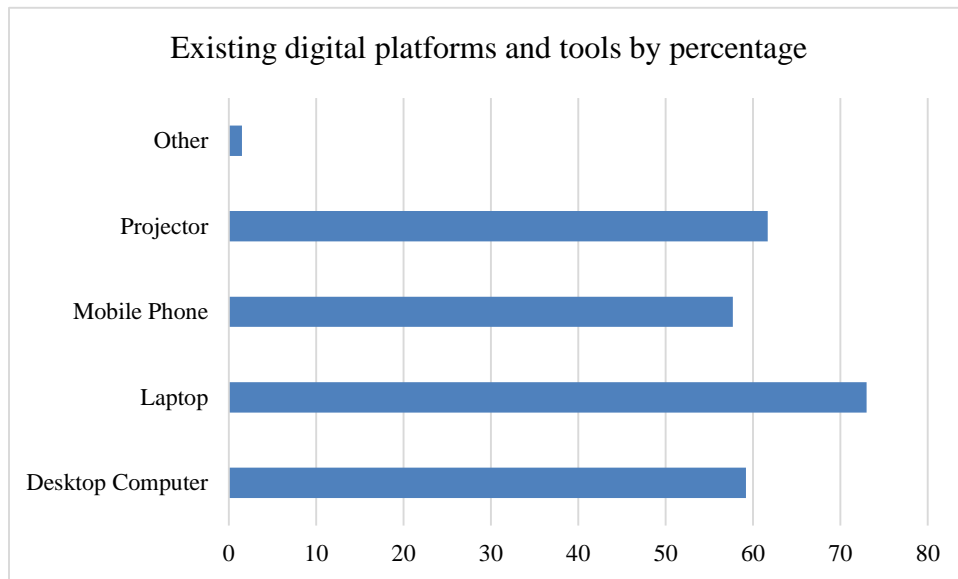
4.4 Technologies used in information literacy training

Information Literacy Training at the Makerere University Library is conducted in the multi-purpose training laboratory (Musoke *et al.*, 2014). The study sought to establish the type of technologies used, their ease of use, their working order, and their sufficiency in number for training using a self-administered structured questionnaire for students, and an interview guide for facilitators.

4.4.1 Existing digital platforms and tools at Makerere University Library

Ascertaining the type of technologies used in training was aimed at establishing a benchmark upon which enhancement would be undertaken.

Figure 16: Existing digital platforms and tools



Source: Field data

As illustrated by Figure 16, majority of the students reported using a number of digital tools such as; Laptop (73%), Projector (61%), Desktop (59.2%) and Mobile phones (57.7%). Percentages exceed 100% because participants had the option to select multiple choices of technologies used. Other digital platforms and tools (1.5%) reported as used during the training included; Digital Cameras, Learning Management Systems (LMSs) i.e., Moodle and Canvas, Tablets, Microphones, the Internet, Light pens, Pointers, Scanners, Television, and Library-specific platforms i.e., MyLoft, LibHub. Results indicate that a number of assorted technologies are currently used in information literacy training and as such, form a good basis for enhancement.

Responses by facilitators

In her interview response, facilitator A concurred with most of the technologies reported by students and elaborated that a blend of online and face-to-face instructional approaches are used to deliver training.

“We use different types of technologies. We use of course the computers, laptops, web browsers, sometimes we conduct online using Zoom and sometimes Google Meet.”

Additionally, facilitator F in his interview response concurred that:

“In terms of Hardware, we have the PCs, Laptops, Mobile phones, External Hard drives and then we have the internet. In terms of software, we have the Microsoft Office Suite, Reference Management software such as Endnote, and Anti-Plagiarism software”

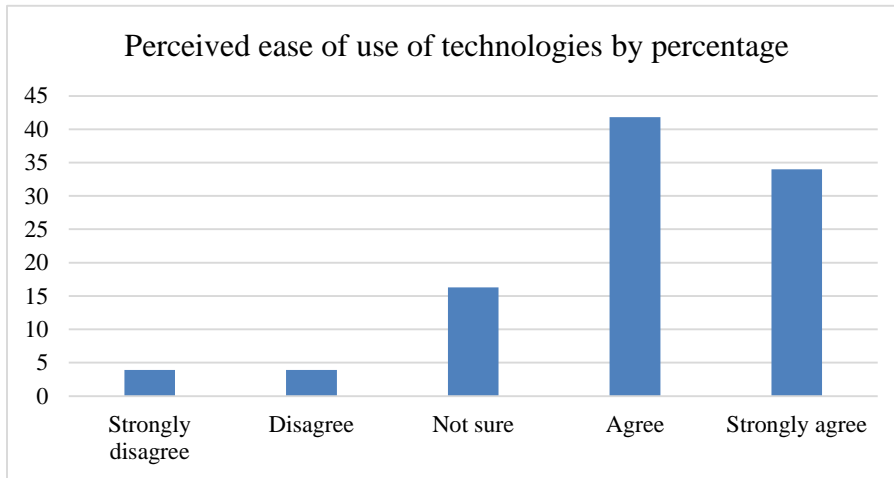
4.4.2 Effectiveness of current technologies in supporting learning and associated challenges

The effectiveness of current technologies in supporting learning was determined by ascertaining their ease of use, working order, and sufficiency in number. The challenges and limitations of technologies used was captured in the responses by facilitators under each item.

4.4.2.1 Ease of use of technologies used in training

Determining the ease of use of technology is meant to establish whether the devices aided or impeded the learning process.

Figure 17: Perceived ease of use of technologies by percentage



Source: Field data

As seen in Figure 17, majority of respondents agreed (46.9%) and strongly agreed (31.6%) that the technologies were easy to use. However, 14.3% reported that they were not sure, 4.1% and 3.1% of respondents disagreed and strongly disagreed respectively that the technologies were easy to use. Study results indicate that majority of respondents by agreeing that technologies were easy to use were able to better focus on the content being taught and were more likely to keep pace with the instructors.

Responses by facilitators

Whereas majority of the students agreed and strongly agreed that the technologies were easy to use, the majority of facilitators reported that it wasn't easy for entry-level undergraduate students to adapt to the technologies used in training.

For example, in her interview response, facilitator M observed that first year students faced a hard time adapting, while postgraduate students were more familiar.

“The first years don’t have computer knowledge. They have knowledge of their phones but when we are training, we are expecting that the students will use computers and not their phones, and besides, their phones don’t have internet. But for the PhD and Masters Students, it’s a little easier because they’ve used these things before while they were at Bachelors level.”

Similarly, facilitator C in her interview response concurred that:

“Of course, we have different categories of learners, the ones we struggle with are the undergraduates because as you know, some of them, especially the first-year students and some second-year students”

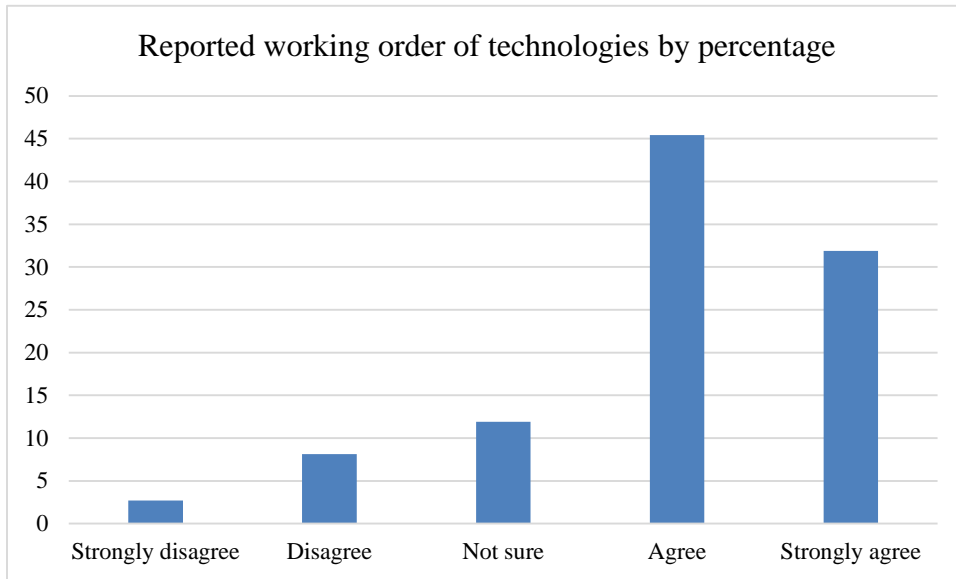
Facilitator K in her interview further clarified that:

“It is a challenge for learners because most of our students come from schools where there are no computers. If at all there are schools with some computers, they are exposed to very little; they just know how to go to Google and type in a query.”

4.4.2.2 Working order of technologies used in training

It was important to determine the working order of the technologies so as to establish whether they slowed down or aided the training process.

Figure 18: Good working order of technologies by percentage



Source: Field Data

As illustrated by Figure 18, whereas majority of respondents agreed (46.4%) and strongly agreed (30.6%) that the technologies were in good working order, 11.7% were not sure, while 8.7% disagreed and 2.6% strongly disagreed. Results are in tandem with findings that majority (73%) of respondents reported using laptops, which places the responsibility of ensuring that they are in good working order on their owners the students.

Responses by facilitators

Contrary to the agreement and strong agreement by majority of the technologies were in good working order, facilitator A in her interview response observed that technologies especially computers were obsolete:

“I think we don’t now have computer labs where we can conduct training like before. Most of those computers have become obsolete, most of them have broken

down, and so we have like one computer lab and there are few computers, around 25 out of 40 computers are working.”

Similarly, facilitator L in her interview response noted that:

“Apart from electricity going off, the biggest challenge we have really faced is lack of computers.”

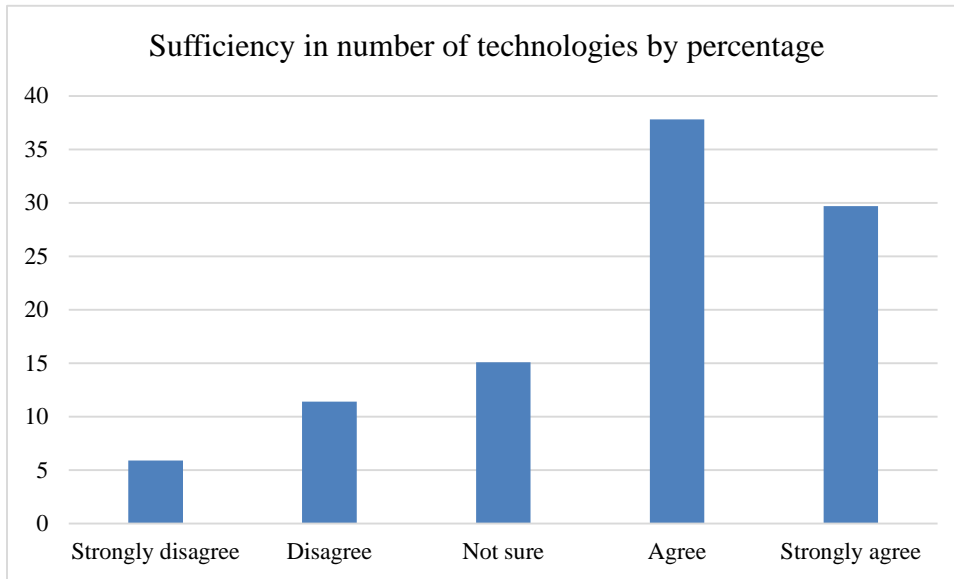
Nevertheless, facilitator E in her interview response noted that once given the opportunity, students are quick to learn:

“Wow, once they are there, my learners are very good because students of these days are not like those of olden days where you feel like they are very rigid people. These ones are eager to learn but they don’t have access and they don’t have enough information to embrace these.”

4.4.2.3 Sufficiency in number of technologies used in training

Ascertaining the sufficiency in number of technologies used in training was aimed at establishing whether the number of devices affected the learning experience.

Figure 19: Sufficiency in number of technologies by percentage



Source: Field data

As seen in Figure 19, the majority 36.7% and 28.6% of participants agreed and strongly agreed respectively that technologies were sufficient in number. 15.8% of participants were not sure, while 13.3% and 5.6% disagreed and strongly disagreed respectively that the technologies were sufficient in number. Results are in tandem with findings whereby apart from the 61% of respondents that reported using a projector and 59.2% that reported using desktops, which are both shared technologies found in the training lab, reported use of laptops (73%) and Mobile phones (57.7%) indicate that personal devices could have contributed to sufficiency in number of technologies used.

Responses by facilitators

Facilitator I in her interview response, despite majority of students agreeing and strongly agreeing that technologies were sufficient in number reported contrary:

“The training lab at the Main Library is small so we have to take a few students for training per session. If we had a lab of at least 100 computers that would be great.”

Similarly, facilitator M in her response disagreed that the technologies were sufficient and elaborated that:

“The resources are missing. If you go to the Lab that we use for training, the Masters lab, the Undergraduate lab, they are ill equipped. We don't have things there. They are obsolete. We are just having monumental computers in the lab but they are not working/functional. So even if we say that we do information literacy training and we have the students, we don't have the equipment to do so given the numbers that are there. If today they say that every student in Makerere has to be trained, we would be overwhelmed, we do not have the resources that are required.”

4.4.3 Opportunities for innovation in technology adoption

Students were asked to suggest additional technologies that can be used to make information literacy training more beneficial to future learners. Some of the suggestions included; incorporation of Artificial Intelligence (AI) in learning, adoption of blended learning that supports both face-to-face and self-paced aspects of delivery, development of electronic tutorials, incorporation of mobile-learning, subsidizing the cost of internet bundles, and electronic scheduling to avoid clashes with other sessions. Other suggestions included; technology that makes the instructor more accessible, incorporation of training onto the Makerere University E-Learning Environment (MUELE), adoption of immersive Virtual Reality (VR) simulations, adaptive learning platforms that make learning more interactive, personalized, and aligned with evolving

digital competencies, and making the software compatible both Apple IOS and Microsoft Windows operating systems.

4.5 Statistics from results

4.5.1 Descriptive Statistics

Descriptive statistics with 95% confidence intervals (CIs) and Cohen's d for gender comparisons, were compiled based on the sample (n = 196; male = 108, female = 88) using SPSS as shown in Table 6 below.

Table 6: Descriptive statistics

Variable	Group	n	Mean	SD	95% CI Lower	95% CI Upper
Overall Effectiveness	Total	196	3.92	0.81	3.81	4.03
	Male	108	4.10	0.75	3.96	4.24
	Female	88	3.79	0.82	3.63	3.95
Pedagogy	Total	196	4.05	0.74	3.95	4.15
	Male	108	4.18	0.70	4.05	4.31
	Female	88	3.90	0.78	3.75	4.05
Technology	Total	196	3.41	1.02	3.27	3.55
	Male	108	3.62	1.08	3.42	3.82
	Female	88	3.24	1.14	3.02	3.46
Content	Total	196	4.18	0.69	4.08	4.28
	Male	108	4.25	0.65	4.13	4.37
	Female	88	4.10	0.72	3.96	4.24

Learner Support	Total	196	3.76	0.88	3.64	3.88
	Male	108	3.85	0.85	3.69	4.01
	Female	88	3.65	0.90	3.47	3.83

Source: Field data

As seen in Table 6 there is very low variability between males and females when it comes to Content and Pedagogy, while there is moderate variability between males and females when it comes to Technology, with males rating all components higher than their female counterparts. Additionally, gender comparison using Cohen's *d* of male versus female showed there is medium effect ($d = 0.39$) when it comes to Overall Effectiveness, medium effect ($d = 0.34$) when it comes to Pedagogy, small-medium ($d = 0.33$) effect when it comes to Technology, small effect ($d = 0.24$) when it comes to Content, and an equally small effect ($d = 0.21$) when it comes to Learner Support.

4.5.2 Inferential Statistics

Inferential statistics such as independent t-tests for gender differences, effect sizes, and correlations we derived from the dataset ($n = 196$; Male = 108, Female = 88) using SPSS. No major dependencies tested because there was no objective measuring dependence of variables as per study design.

Table 7: Gender Differences (Independent t-tests)

Variable	Male Mean (SD)	Female Mean (SD)	t (df=209)	p-value	Mean Difference (95% CI)	Cohen's d (95% CI)
Overall Effectiveness	4.15 (0.72)	3.85 (0.79)	3.12	.002	0.30 [0.11, 0.49]	0.39 [0.12, 0.66] medium)

Technology Access/Use	3.68 (1.05)	3.32 (1.10)	2.45	.015	0.36 [0.07, 0.65]	0.33 [0.06, 0.60] (small-medium)
Content Relevance	4.28 (0.64)	4.12 (0.71)	1.78	.077	0.16 [-0.02, 0.34]	0.24 [-0.03, 0.51] (small)
Learner Support	3.88 (0.83)	3.70 (0.89)	1.62	.107	0.18 [-0.04, 0.40]	0.21 [-0.06, 0.48] (small)

Source: Field data

Table 7 illustrates that there were significant gender differences in overall effectiveness and technology, with males higher, possibly due to better device access, while gender differences were non-significant for content relevance and learner support, suggesting universal appeal.

Furthermore, Table 8 below presents the findings from correlations.

Table 8: Correlations (Pearson r, key variables)

Pair	r	p-value	95% CI for r	Interpretation
Technology & Overall Effectiveness	.58	< .001	[.47, .67]	Strong
Content & Overall Effectiveness	.62	< .001	[.52, .71]	Strong
Learner Support & Overall	.55	< .001	[.44, .65]	Moderate-Strong
Technology & Learner Support	.48	< .001	[.36, .59]	Moderate

Source: Field data

Table 8 illustrates that there is a strong correlation between the pairs of Technology and Overall Effectiveness as well as Content and Overall Effectiveness. This implies that Technology and Content are the strongest predictors of perceived Information Literacy Effectiveness.

Other inferences such as (ANOVA $F(4,191) = 1.42, p = .228$) showed that the year of study had no significant effects, suggesting that students Information Literacy needs were consistent across years of study.

4.6 Framework development for effective online information literacy trainings

4.6.1 Stakeholder input on framework requirements

Students were asked to suggest ways in which a framework for conducting effective online information literacy trainings can be developed. Responses were extracted from Google Form; the data was cleaned and coded.

Table 9: Summary of components and quotes for online information literacy training framework

Components	Description	Example Quotes
Learning Needs Assessment	Respondents observed the need to assess needs of learners prior	<p>“Assess the needs of the students and tailor the learning to their needs, also assess previous learners to see what wasn’t learnt properly”</p> <p>“By directly interacting with the learners and users to find out their challenges”</p>
Well-defined Learning Objectives	Respondents noted that training objectives have to be well defined to guide learners	<p>“Align objectives with academic, professional, or lifelong learning needs”</p> <p>“The expected learning outcomes should be clear”</p>

Well-structured curriculum	Respondents noted that training should be guided by modular course-long curriculum	“Ensure a logical progression from basic to advanced topics.” “Have a large coverage from the pre-clinical to the clinical years”
Customised content delivery	Respondents observed the need for content and features that addresses various learning styles	“Use videos, quizzes, infographics, and interactive exercises to enhance engagement, Provide hands-on practice with databases, citation tools, and AI research assistants.”
Improved Infrastructure Quality	Respondents noted the need to improve delivery by providing reliable connectivity and equipment	“Through providing Internet access and gadgets to all those who want online literacy training” “I would start with the ones who don't have laptops or phones by going to classes or pinning up announcements on noticeboards to inform people about the course”
Assessment, Feedback and Certification	Respondents called for inclusion of regular assessment, feedback and recognition of completion	“People prefer having a certificate of completion afterwards. Most people would join” “Provide personalized feedback and improvement suggestions.”

Pilot Project	Respondents observed the need to pilot the training before it is rolled out	“Pilot and Refine the Framework” “Consider testing it with the intended beneficiaries”
Accessible, Inclusive, Flexible, student-centered Learning	Respondents noted the need to cater for students with disability and for flexible learning hours	“Design materials that support diverse learning needs (e.g., captions, screen reader compatibility), offer self-paced learning options alongside instructor-led sessions.” “It should also include those that cannot see.”
Policy environment	Respondents noted the need for institutional support to boost training	“Inclusion in the weekly timetable” “Running different sessions all through the semesters” “More teachers and computers”

Source: Field data

Table 9 above summarises the components identified through thematic analysis of qualitative responses collected from students in respect of the third study objective; to develop a framework for conducting effective online information literacy training. The components identified together with the descriptions and example quotes offer considerations in line with student, instructor and institutional requirements that can inform the development of the proposed framework.

Input from instructors

Responses from instructors were analysed and input into framework requirements clustered according to pedagogy, technology, content and learner support.

Pedagogically, facilitator F in his response noted that:

"Overall, it is important that we keep using blended learning, which makes use of both physical and virtual learning approaches. This will greatly enhance the mobilization of students to attend information literacy training and eliminate the struggle for time through coordinated scheduling of both information literacy and other course units."

Similarly, facilitator I in her response called for a hands-on approach to student learning:

"As trainers we need to change the way we are delivering the sessions, we need to make it more interactive, maybe give the students more tasks to do so that they learn better, maybe use online forums and discussion groups so that the students themselves actually do the tasks, and not for us to stand up there and give them the information."

Facilitator H in her response emphasised the need for inclusion of information literacy in curricula:

"I would recommend that information literacy is embedded in the curriculum, it should be a must for everyone because it is not included in their curriculum and I don't think they feel it important to have it. So, they don't put much importance on it because it is not even examinable."

Technologically, facilitator E in her interview response proposed the inclusion of Artificial Intelligence (AI):

“We need to embrace artificial intelligence (AI) because I think we keep feeling that we should maintain what we have, and accept change, not keeping analogue.”

Additionally, facilitator B in her interview response noted the need to provide various option when deploying technology:

“You must make sure that people are comfortable with it. If somebody is not comfortable with Zoom, you can ask if they’ve used Google Meet or TEAMS.”

In terms of content, facilitator G called for the inclusion of animations and YouTube videos to better illustrate materials:

“If you can create self-help animations, the person is guided and by the time they come, they have seen the system. For example, when DICTS people, they have created YouTube videos. These can also help.”

Facilitator M in her interview response advocated for collaboration between faculty and librarians to enhance discipline-specific training:

“Information Literacy Training should be a joint venture between faculty and librarians because librarians have the knowledge on how to but we do not have the knowledge of the authorities in various disciplines like psychology, social sciences or certain topics.”

In terms of learner support, instructors called for approaches that take advantage of the portability of mobile phones. Facilitator D in her response noted:

“If I have this phone, I can respond to a user and give them the assistance they need even when I’m away from my computer. The portability of a mobile phone is that important, even outside the working hours.”

Similarly, facilitator M in her response added:

“For Mobile training, if a student came one-on-one and probably found me in the compound or on a weekend, or if a student wants to access the facilities on his phone, that’s when I do one-on-one.”

Furthermore, facilitator O in his interview response emphasized the importance of feedback:

“The other thing we can encourage is developing active feedback mechanisms. Every time you train these students, give them an assignment as a way of knowing; that assignment acts as a feedback mechanism.”

For a more holistic approach, facilitator B in her response advocated for creation of a research support centre:

“I advocate for the research support centre because within this centre, those who will not be able to understand during training will come on a person-to-person follow-up and then you include the hands-on.”

4.6.2 Key components of framework an effective framework

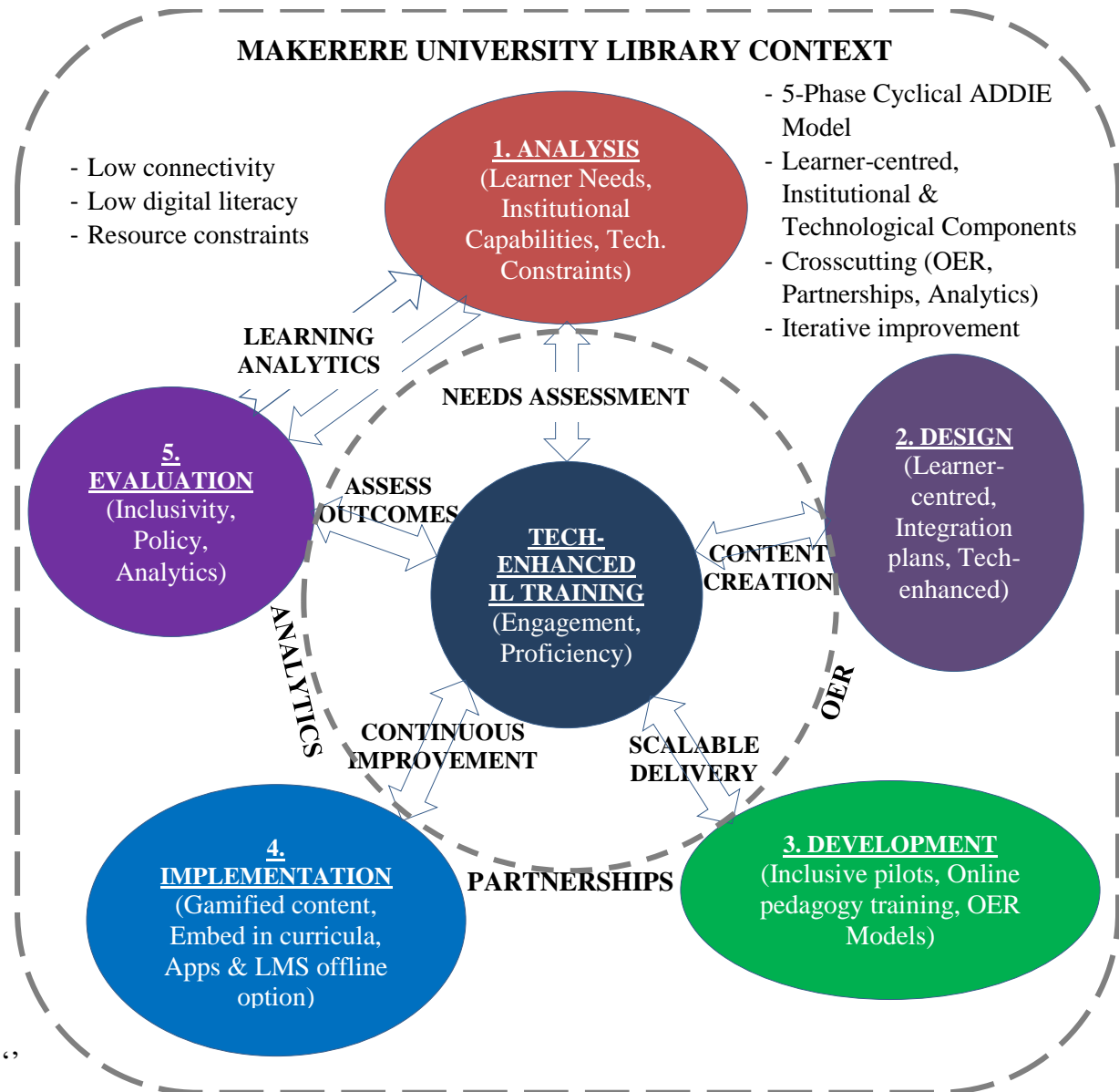
The components identified through input from students and instructors are in agreement with Lobo and Dhuri (2023) who posit that pedagogically, constructivist approaches that empower students to learn by actively engaging with their environment together with trained instructors will ensure

learner-centred information literacy delivery. Technologically, results are in agreement with Choundhary and Bansal (2022) who note that planning for mobile, offline-capable apps that take advantage of open-source learning management systems (LMS) such as Moodle can enhance information literacy training. Furthermore, components align with research that content containing gamified, discipline-specific modules boosts student engagement with 85% completion reported (McGuinness & Fulton, 2019). In terms of learner support, findings are in line with Hughes *et al.* (2019) who note that conducting pilot studies with scaffolding especially for those with low digital literacy levels can make the training more inclusive when eventually rolled out.

4.6.3 Proposed model for online information literacy training

From study findings and review of literature, the development of a framework for conducting effective online information literacy trainings for students at the Makerere University Library was guided by the ADDIE (Analysis, Design, Development, Implementation, Evaluation), an instructional systems development (ISD) model that provides a systematic process for creating effective information literacy programs (Molenda, 2003). Furthermore, framework development was theoretically grounded in constructivism, which posits that learners construct knowledge through active engagement with their environment, and building on prior experiences (Kolb, 2014). Guided by findings, the study proposes the framework below;

Figure 20: Proposed framework for technology-enhanced information literacy training



Source: Author's own

As illustrated in Figure 20, the proposed framework for technology-enhanced information literacy training for students in the context of Makerere University Library adopts a five-phase cyclical form guided by the ADDIE Model's interconnected Analysis, Design, Development,

Implementation, Evaluation phases (Molenda, 2003). Each of the five phases integrates learner-centred, technological and institutional components, interconnected by crosscutting enablers such as; Open Educational Resources (OER) (Hughes *et al.*, 2019), partnerships between libraries and various stakeholders (Caffrey *et al.*, 2023; Corral & Jolly, 2022; Pokhrel & Chhetri, 2021; Lobo & Dhuri, 2023), as well as performance (Corral & Jolly, 2022) and behavioral analytics (Liu & Li, 2025) for sustainability. Finally, the evaluation and analysis stages are connected by a feedback loop that ensures that iterative improvements to the framework are driven by learning analytics.

4.6.4 Incorporating best practices and benchmarks from within and outside Makerere

In detail, at the heart of the framework is the delivery of scalable, accessible, and effective information literacy training backed by technology-enhanced online platforms in a way that can be sustainably viable for low-resourced institutions (ACRL, 2016; UNESCO, 2011), with 60 to 75% growth in engagement due to incorporation of mobile applications, offline capabilities and Open Educational Resources (OER) (Huang, 2024), and up to 80% in proficiency due to aligning training tests and rubrics to ACRL and SCONUL skills (McGuinness & Fulton, 2019). In the analysis phase, learner needs assessment should consider digital literacy, diversity especially due to origin either from rural or urban school settings, age, gender and other factors. Institutional capabilities will be assessed through evaluation of existing policies, funding allocated to the Library's Training role and current as well as prospective partnerships that can support training. Technology constraints such as availability and stability of internet connections, accesses to computers and other handheld devices as well as suitability of online learning platforms for training will be assessed.

The Design phase should ensure that content creation is learner-centred by considering inclusive, gamified, discipline-specific requirements of various users (McGuinness & Fulton, 2019). Institutionally, plans that integrate Information Literacy into curricula should be designed and implemented and partnerships with telecom companies to zero-rate institutional learning platforms explored. Technological design should enhance training by planning for mobile, offline-capable apps that take advantage of open-source learning management systems (LMS) such as Moodle with gamified elements (Choundhary & Bansal, 2022).

The Development phase should conduct pilot studies with learners using inclusive, gamified content with scaffolding especially for those with low digital literacy levels (Hughes *et al.*, 2019). Institutionally, information literacy instructors should be trained in pedagogy skills and where necessary, partnerships with other players forged to develop skills where resources are unavailable or additional equipment is required. Technologically, mobile apps with offline capability, Open Educational Resources (OER)-based modules and Artificial Intelligence (AI)-driven tutorials should be developed.

At the Implementation phase, focus should once again be on the learner-centred approaches that deliver inclusive, gamified, discipline-specific content to meet requirements of various users (McGuinness & Fulton, 2019). Institutionally, continuous improvement should be the focus by ensuring that information literacy is embedded in all curricula especially when revised, and funding secured through partnerships to support curriculum integration and implementation (Caffrey *et al.*, 2023). Technologically, deployment should be in the form of mobile-based applications and learning management systems (LMS) with offline capabilities, backed by pilots of Artificial Intelligence where feasible (Choundhary & Bansal, 2022; Almenara *et al.*, 2022).

The Evaluation phase should assess outcomes using learner-centred approaches that measure proficiency, engagement and inclusivity using training tests and rubrics aligned to ACRL and SCONUL skills (McGuinness & Fulton, 2019). Institutionally, evaluation should assess the effectiveness of information literacy policies and the impact of partnerships established, if any, on training (Caffrey *et al.*, 2023). Technologically, performance analytics (Corrall & Jolly, 2022) and behavioral analytics (Liu & Li, 2025) should be used to track engagement and navigation.

4.7 Strategies for sustainability, scalability and inclusiveness

Therefore, the strategies for sustainable, scalable, and inclusive online technology-enhanced information literacy training include: For sustainability, deploy OER to reduce costs (Huang, 2024) and secure partnerships for funding (Caffrey *et al.*, 2023). For scalability, deploy mobile, offline-capable apps and open-source LMS (Choundhary & Bansal, 2022), and negotiate zero-rating of university websites with telecommunication companies. For inclusiveness, develop multilingual, discipline-specific content and provide scaffolding for users with low digital literacy (Hughes *et al.*, 2019), and incorporate analytics-driven feedback and librarian training ensure continuous improvement (McGuinness & Fulton, 2019).

4.8 Summary

The findings presented in this chapter depict that students undertaking training and their instructors perceive information literacy as important for both their current academic undertakings and future careers. Furthermore, findings from students depict their perception of instructors as knowledgeable and supportive during training. Findings equally depict that some forms of technology are currently used in information literacy training at the Makerere University Library, and that these technologies are easy to access, navigate and that they enhanced the learning

experience of users. And finally, the findings present key considerations that can inform development of a framework for conducting effective information literacy training online, guided by the ADDIE Model's five phases, each integrating learner-centred, technological and institutional components, interconnected by OER, partnerships, and analytics as crosscutting enablers. The findings from this study depict the role of technology in enhancing information literacy training at the Makerere University.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter discusses the findings, draws conclusions, and makes recommendations from data collected from students using the self-administered structured questionnaire and personal interviews with instructors using an interview guide. It is made up of six sections. The first section discusses findings from the three research objectives namely; to explore the perceptions and needs of students undertaking information literacy trainings at the Makerere University Library, to establish the technologies used to conduct information literacy trainings for students at the Makerere University Library, and develop a framework for conducting effective online information literacy trainings for students at the Makerere University Library. The second section draws conclusions from the findings and the third section stipulates the contribution to knowledge by the study and the fourth states the study's limitations. The fifth section makes recommendations based on study findings, while the sixth section proposes areas for further research.

5.1 Discussion of findings

5.1.1 Perceptions and needs of students undertaking information literacy trainings

The study findings revealed that students overall perceived information literacy training as helpful, particularly in aspects of reference management, database searching, and using the online catalog. Findings further showed that majority of students agreed or strongly agreed that the training improved their skills in identifying, discovering, evaluating, and using information effectively. However, instructors often rated students' information literacy competencies lower than students'

self-perceptions, while many students felt the training time was insufficient. Furthermore, students perceived technologies used in the training as accessible, easy to use, and effective, and either agreed or strongly agreed that instructors were knowledgeable and supportive. Finally, students recognized information literacy as important for their academic and future careers, and expressed willingness to recommend the training and participate in future sessions.

This is in agreement with Roseler *et al.* (2019) whose study revealed that information literacy training enhanced students' ability to utilise reference management systems, appropriately cite and reference text, and ethically participate in learning communities. Wu *et al.* (2022) who examined teachers' competence to develop students' information literacy (TCDSIL) concurred that school type, resources for instruction, network bandwidth, teachers' perceived usefulness, information processing skills, and information ethics were of great influence on students' perception. As such, accessibility and ease of use of technology have been demonstrated to increase effectiveness of training and stimulate students to apply knowledge acquired in their everyday practice (Krylova-Grek, 2019). Extremely important as well is the amount of class time allocated for information literacy training as it helps students grasp and later apply this knowledge practically (Majid *et al.*, 2020). The recognition that information literacy is important and the willingness to take part in and recommend future trainings to peers is according to Anthonysamy *et al.* (2020) an indicator of the ability of students to self-regulate. This ability to self-regulate the researchers say is a basis for fostering sustainable lifelong learners in twenty-first-century as students become more proficient at use of digital tools.

5.1.2 Technologies used to conduct information literacy trainings for students

Findings from the study reveal that the technologies most frequently used for conducting information literacy training in the Library include Laptops, Projectors, Desktop computers and Mobile phones. Other technologies reported used to a lesser extent included; Digital Cameras, Learning Management Systems (LMSs) i.e., Moodle and Canvas, Tablets, Microphones, the Internet, Light pens, MyLoft, Pointers, Scanners and Television. These technologies were chosen because they were sufficient in number, easy to use, and in good working order. Findings further revealed that the technologies used in training were easy to access and navigate by the students, and their use enhanced the learning experience. The findings suggest the learners utilize a number of technologies in information literacy training and this forms a good basis for further enhancement. Findings from the instructors nevertheless depicted the contrary; learners struggled to use computers, many of the computers were obsolete and insufficient in number. The discrepancy can be attributed to the fact that laptops and mobile phones, which were students' personal property, formed the majority of technologies used. Therefore, although the students were proficient at using their own devices, which were in good working order and sufficient in number, the computers in the University Library's training lab were lacking in the same respect.

These findings are in agreement with Zhang and Zou (2021) whose study identified computers, mobile devices, printed materials, audio players, and the integration of PowerPoint slides and stereo speakers as some of the main types of tools used in technology-enhanced learning. Findings are also in line with Krylova-Grek (2019) who recommends use of portable devices for technology-enhanced training owing to their lightweight, small size, long battery life, and high-resolution features that make them convenient and easy to use by learners. Furthermore, findings are in agreement with Becker (2018) who argues that librarians, who have traditionally

championed information literacy, are in the Digital Age having to shoulder additional responsibilities of equipping learners with digital literacy skills in addition to traditional approaches to information literacy, especially as technology continues to enhance learning and access to electronic resources.

5.1.3 Framework for conducting effective online information literacy trainings

The proposed framework for conducting effective information literacy training online adopts a five-phase cyclical model structured around the ADDIE Model (Analysis, Design, Development, Implementation, Evaluation). The framework synthesizes insights from empirical studies, and components from students' and instructors' prior responses that included; Learning Needs Assessment, Well-defined Learning Objectives, Well-structured curriculum, Customised content delivery, Improved Infrastructure Quality, Assessment, Feedback and Certification, Pilot Project, Supportive policy, learner support, and Pedagogical Training. Furthermore, each of the framework's five phases incorporates the above themes, generally classified as learner-centred, institutional, and technological.

The framework takes cognizance of the Ugandan context characterized by low connectivity, low digital literacy and resource constraints by incorporating cross-cutting enablers such as OER, partnerships with other entities, and analytics for sustainability. Empirical studies that address sustainability are drawn from both the Global North where deployment of Asynchronous LMS, gamification, and OER achieved 75–85% engagement and African studies where deployment of mobile, offline training modules, OER and partnerships achieved 60-75% engagement. The framework is grounded in constructivism by ensuring that learner-centred approaches are prioritized across all five phases of analysis, design, development, implementation and evaluation.

For continuous improvement, learning analytics gathered throughout the five stages are used as feedback to improve subsequent iterations of the framework.

Study findings are in agreement with Huang (2024) whose emphasis of learning needs assessment and delivery of customized content via AI-driven tutorials, enhanced students' engagement by up to 70%. Furthermore, the inclusion of gamified content and assessment can be used to achieve completion rates of up to 85% (McGuinness & Fulton, 2019). Findings are equally in agreement with Corral and Jolly (2022) whose emphasis of the use of pilot projects and improvement in infrastructure quality especially through partnerships resulted in 25% improvement of access to learning materials by students. In terms of learning analytics, findings are in agreement with McGuinness and Fulton (2019) whose use of analytics gathered from students in Ireland reduced drop-off by 20%. Findings are also in agreement with Liu and Li, (2025) who used analytics to identify 35% of navigation issues among students in China.

5.2 Conclusion

Findings from the study reveal that majority of students perceive the technologies used in training as easy to use, in good working order and sufficient in number. Nevertheless, findings from the instructors reveal that learners struggle to use computers, many of the computers are obsolete and insufficient in number. Furthermore, majority of students perceive the training as helpful, with reference management, database searching, and using the online catalog reported as the most recalled aspects of training. Students' perceptions depict that information literacy training enhanced their skills in the four aspects of identifying their information need, discovering the information, evaluating it and effectively using it. On the contrary, the instructors perceive students as somewhat competent in terms of information literacy skills. Both students and instructors

perceive the time allocated for training as insufficient. Nevertheless, students perceive instructors are knowledgeable and supportive, and that information literacy training is important to both their academics and future career.

Furthermore, from the study findings, Laptops, Projectors, Desktop computers and Mobile phones were the most frequently used technologies for information literacy training. Other technologies reported used to a lesser extent included; Digital Cameras, Learning Management Systems (LMSs) i.e., Moodle and Canvas, Tablets, Microphones, the Internet, Light pens, MyLoft, Pointers, Scanners and Television. This use of technology in information literacy training forms a good basis for further enhancement.

Finally, study findings of a proposed framework for conducting information literacy training for students in the context of Makerere University Library adopts a five-phase cyclical form guided by the ADDIE Model, with each phase integrating learner-centred, technological and institutional components, interconnected by Open Educational Resources (OER), partnerships and analytics as crosscutting enablers, and the evaluation and analysis stages are connected by a feedback loop for iterative improvements driven by learning analytics. The ADDIE Model therefore provides a good basis for creating a framework that can be used to deliver scalable, accessible, and effective information literacy training at the Makerere University Library through technology-enhanced online platforms, that take cognizance of existing learner, technological and institutional constraints to ensure long-term viability.

5.3 Contribution to Knowledge

The proposed ADDIE Framework for Online Information Literacy Training at Makerere University Library offers the following original contributions to the global and African IL

literature. Firstly, it introduces an “offline-first, zero-rated” delivery layer within the Development and Implementation phases, which combines downloadable mobile modules and zero-rating of learning platforms hosted under the university domain by telecommunication companies. This proposition is in agreement with studies highlighting the persistent 20–40% access barrier reported across Zimbabwe and Ghana (Huang, 2024; Abdulai *et al.*, 2021). Additionally, the framework proposes a financially replicable sustainability pathway absent in earlier African frameworks that relied solely on donor funding, by integrating institutional cost-recovery mechanisms such as repurposing ICT fees charged on tuition and advocating for zero-rating of the Makerere University domain by telecom companies.

5.4 Limitations

The study greatly benefitted from the support of staff in the Makerere University Library by the provision registration lists from various cohorts that undertook information literacy training. However, there was likely limitations of sample representativeness as some colleges had more participants than others, increasing their likelihood of being sampled. Furthermore, lists for cohorts such as PhD and Masters were fewer compared to those of undergraduates. Furthermore, the study experienced low response rates by students to the self-administered questionnaires. This was further compounded by a seeming lack of interest by some respondents who were unable to recall aspects of the training, especially if the training was conducted more than two years ago, hence affecting accuracy of responses. The study also encountered measurement biases as students always rated their self-perception in terms of skills attained higher than their instructors, and students who reported using personal laptops and smartphones always rated the accessibility, working order and ease of use of technologies higher than the actual laboratory-based technologies which are rated obsolete and insufficient by instructors. Methodologically, due to time constraints,

the study was unable to carry out pilot testing of the proposed framework so as to validate its empirical robustness and practical ability.

5.5 Recommendations

The recommendations for technology-enhanced information literacy training at the Makerere University Library are;

In line with the perceptions and needs of students undertaking information literacy training, new desktop computers should be procured to replace obsolete ones in the Main Library and college-based labs so as to reduce reliance on personal devices, some of which may be inadequate for training needs. Additionally, institutional bandwidth should be increased and more robust Wi-Fi networks installed in public spaces, colleges, and halls of residence to address students' need for reliable connectivity. Ultimately, information literacy should be incorporated into curricula with examinations to ensure relevance, training should officially be allocated time in teaching timetables, and standby generators procured and fueled to ensure uninterrupted power supply during training.

In line with technologies used to conduct information literacy training, the ICT funds charged on tuition should be used to procure desktop computers, increase bandwidth, and ensure dedicated bandwidth to platforms such as the Virtual Digital Library Environment, which are critical for information literacy delivery. Additionally, monitoring and upgrades of server infrastructure should be done at least annually to ensure that access to resources and systems they hold is reliable. Equally important is the advocating for zero-rating the Makerere University domain (<https://mak.ac.ug>) via partnerships with the Ministry of ICT, Uganda Communications

Commission and telecommunication companies so as to subsidize or eliminate data costs incurred by students in accessing learning materials especially while off-campus.

Finally, in line with developing a framework for conducting effective online information literacy trainings, a user-friendly design should be adopted and tailored to Makerere University's context for all learning platforms so as to enhance engagement and completion of trainings by students. Technologically, computers, bandwidth, and Wi-Fi networks should be upgraded in order to support the design and implementation of mobile-friendly, offline-capable training delivery. Institutionally, policy to guide conduct and incorporation of information literacy training into curricula should be formulated and implemented, a standard training manual created, and instructors trained in order to ensure the development and implementation of uniform, pedagogy-driven instruction. Furthermore, additional professional library staff should be recruited to ensure scalability as training becomes institutionalized.

5.6 Suggestions for further research

Research on how uptake of information literacy training influences the utilization of e-resources procured by the Main University Library needs to be undertaken to ascertain if training not only improves the research skills of students but also if the University receives value for money invested in e-resources.

Further research needs to be conducted to establish the extent to which existing platforms such as the Makerere University E-Learning Environment (MUELE) can be used to enhance information literacy training, especially in the face of resource constraints.

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APPENDICES

APPENDIX 1: INTERVIEW GUIDE FOR FACILITATORS

Title: Technology-Enhanced Information Literacy Training for Students at the Makerere University Library

Researchers have identified four main competencies that content used in information literacy training for students is meant to address namely;

- Recognizing a need for information
- Locating information
- Evaluating information
- Effectively using information

1. What technologies do you have access to in the conduct of Information Literacy Training to help students acquire the above competencies?
2. How comfortable are you with using the above technologies in Information Literacy Training?
3. How easy is it for learners of Information Literacy to adapt to these technologies?
4. What technologies do you think can be used to enhance the four competencies above in Information Literacy Training?
5. What is your perception of Information Literacy as a concept for students' academic and professional success?
6. How would you rate the students in each of the four competencies above? Please use the scale: Highly competent/Competent/Somewhat competent/Not competent
7. What teaching strategies can be used to improve students' ratings for each of the four competencies above?
8. What barriers, if any, have you encountered as a trainer of Information Literacy for each of the four competencies above?
9. What actions can be taken to minimise or eliminate these barriers?

Conclusion:

Thank you for taking time to participate in this interview.

APPENDIX 2: SELF-ADMINISTERED QUESTIONNAIRE FOR STUDENTS

Technology-Enhanced Information Literacy Training for Students at the Makerere University Library

Introduction

Thank you for sparing time to participate in my study on Technology-Enhanced Information Literacy Training for Students at the Makerere University Library in respect of the Masters of Instructional Design and Technology (MIDT) of Makerere University. This study will investigate how the various technologies can be used to enhance the teaching and learning of information literacy as conducted by the Makerere University Library. Your responses and suggestions will be very crucial in helping me understand what technologies are currently used in information literacy training as well as your perceptions and needs in as far as information literacy training is concerned. I kindly request that you provide your honest opinion as there is no right or wrong answer and every opinion counts. The information provided will strictly be used for academic purposes and be treated with confidentiality and anonymity. Before beginning the survey, please read the information under the Informed Consent section below and, if it is agreeable, click yes to proceed. All changes you make to the form will be automatically saved if you are signed into your Gmail account. Thank you for your time and kind participation in this study.

Sincerely

Mark Nabende Wamai

Informed Consent

The research study aims to enhance information literacy training for students at the Makerere University Library by establishing the technologies currently used, exploring current perceptions and needs of students and developing a framework for conducting technology-enhanced information literacy trainings. As a participant, you are kindly requested to complete this survey, which will be used for research purposes only and should take approximately 10 minutes. The information provided will be treated with utmost confidentiality and anonymity. By agreeing to participate in this study, you indicate that you have read and understood the information provided in this consent form and you voluntarily agree to take part in the study.

I have read the information contained in the Informed Consent section and agree to participate in the survey

Yes
No

Section A: Demographic Information

1. Please select your gender

Male
Female

2. Please select your age range

Below 20 years
20 - 24
25 - 29
30 - 34
35 - 39
40 - 44
45 - 49
Above 50 years

3. Please select the current programme you are enrolled for

Diploma
Undergraduate Degree
Postgraduate Diploma
Masters
PhD

4. Please select your College from the drop-down menu below

1. College of Agricultural and Environmental Sciences (CAES)
2. College of Business and Management Sciences (CoBAMS)
3. College of Computing and Information Sciences (CoCIS)
4. College of Education and External Studies (CEES)
5. College of Engineering, Design, Art and Technology (CEDAT)
6. College of Health Sciences (CHS)
7. College of Humanities and Social Sciences (CHUSS)
8. College of Natural Sciences (CoNAS)
9. College of Veterinary Medicine, Animal Resources and Biosecurity (CoVAB)
10. School of Law (LAW)

5. Please select the year you undertook Information Literacy Training.

2024
2023
2022
Before 2022

SECTION B: Perceptions of students undertaking Information Literacy Training

6. How would you rate your overall experience of the Information Literacy Training you received?

Please rate your overall experience of the training on a scale of 1-5 whereby

1 = Not helpful, 2 = Somewhat helpful, 3 = Not sure, 4 = Helpful, and 5 = Extremely Helpful

- 1 Not helpful
- 2 Somewhat helpful
- 3 Not sure
- 4 Helpful
- 5 Extremely helpful

7. What aspects of Information competence did you cover during Information Literacy Training? (Choose all that apply)

- Using the online catalog
- Database searching
- Reference management
- Evidence-based research
- Basic user orientation to information services
- Systematic reviews
- Anti-plagiarism checks

8. The aspects of information competence covered during the training helped me recognize the need for information in my academics and life in general.

Please rate your recognition of the need for information on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

9. The aspects of information competence covered during the training equipped me to locate the information I required.

Please rate your ability to locate the information you required on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure

- 4 Agree
- 5 Strongly agree

10. The aspects of information competence covered during the training equipped me with skills me to evaluate information for my assignments/project work.

Please rate your ability to evaluate information on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

11. The aspects of information competence covered during the training enabled me to effectively use information to write my assignments/project work.

Please rate your ability to effectively use information on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

12. The time allocated to Information Literacy Training was sufficient to cover all the above aspects of Information competence.

Please rate the time allocated on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

13. The technologies used in Information Literacy Training were easily accessible.

Please rate the ease of access of technologies used in Training on a scale of 1-5 whereby

1 = Not accessible, 2 = Somewhat accessible, 3 = Not sure, 4 = Accessible, and 5 = Very accessible

- 1 Not accessible
- 2 Somewhat accessible
- 3 Not sure
- 4 Accessible
- 5 Very accessible

14. The technologies used in Training were easy to navigate and helped me find the information I was looking for.

Please rate the ease of navigation of technologies used in Training on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

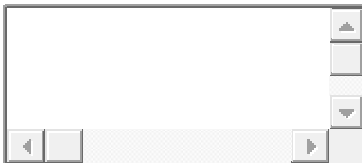
15. The technologies used in Training greatly enhanced my teaching and learning experience.

Please rate the enhancement by technologies on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

16. What additional technologies or aspects of information competence can be used to make Information Literacy Training more beneficial for future learners?



17. The facilitators of the Information Literacy Training were very knowledgeable and helped me to appreciate the importance of this course.

Please rate the facilitators' knowledge on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

18. I feel like I received enough support from the facilitators during the Information Literacy Training course.

Please rate the level of support received from facilitators on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

19. Information Literacy Training is important for my academics and future career.

Please rate the importance of Information Literacy Training on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

20. I would be willing to recommend the Information Literacy Training Course to my friends or fellow students.

Please rate your willingness to recommend the Training on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure

- 4 Agree
- 5 Strongly agree

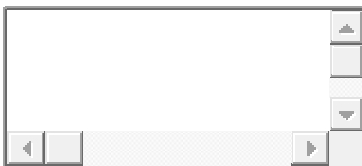
21. I would be willing to take part in future/additional Information Literacy Trainings either during or even after my academics.

Please rate your willingness to take part in future trainings on a scale of 1-5 whereby

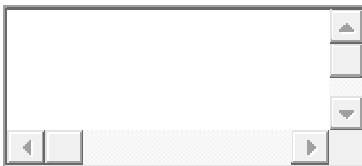
1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

- 1 Strongly disagree
- 2 Disagree
- 3 Not sure
- 4 Agree
- 5 Strongly agree

22. What challenges do you face during your Information Literacy Training?



23. Suggest ways in which the challenges you faced during your Information Literacy Training can be solved?



SECTION C: Technologies used to conduct Information Literacy Training

24. Did you use any form of technology in your Information Literacy Training Class?

- Yes
- No

25. If yes, please select the technology that you used from the options below. (Choose all that apply)

- Desktop Computer
- Laptop
- Mobile Phone
- Projector
- Other (Please specify below)

26. Please specify any additional technology used that is not listed above.

27. I found these technologies easy to use during my Information Literacy Training Class.

Please rate the ease of use of technologies on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

1 Strongly disagree

2 Disagree

3 Not sure

4 Agree

5 Strongly agree

28. The technologies used in Information Literacy Training were in good working order.

Please rate the working order of technologies on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

1 Strongly disagree

2 Disagree

3 Not sure

4 Agree

5 Strongly agree

29. The technologies used in Information Literacy Training were sufficient in number. (There was neither overcrowding nor long waiting period before I got the chance to use the technologies.)

Please rate the sufficiency of technologies on a scale of 1-5 whereby

1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5 = Strongly agree

1 Strongly disagree

2 Disagree

3 Not sure

4 Agree

5 Strongly agree

30. In your opinion, what constitutes effective online information literacy training?

An empty rectangular text input field with a light gray background. On the right side, there are three vertically stacked buttons: a small upward-pointing triangle, a square, and a downward-pointing triangle. On the bottom left, there are two small square buttons, one with a left-pointing triangle and one with a right-pointing triangle. On the bottom right, there is a larger square button.

31. What guidelines can inform the development of training materials for effective online information literacy trainings?

An empty rectangular text input field with a light gray background. On the right side, there are three vertically stacked buttons: a small upward-pointing triangle, a square, and a downward-pointing triangle. On the bottom left, there are two small square buttons, one with a left-pointing triangle and one with a right-pointing triangle. On the bottom right, there is a larger square button.

32. How can a framework for conducting effective online information literacy training be developed?

An empty rectangular text input field with a light gray background. On the right side, there are three vertically stacked buttons: a small upward-pointing triangle, a square, and a downward-pointing triangle. On the bottom left, there are two small square buttons, one with a left-pointing triangle and one with a right-pointing triangle. On the bottom right, there is a larger square button.

Thank you for taking time to fill in this study. If you have any additional comment, please enter it below or click Submit to complete this exercise.

A simple empty rectangular text input field with a thin black border.