Evaluation of Information literacy training for enhanced teaching, learning, and research competence for academic staff and students at the University of Rwanda: A descriptive mixed-method study

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Abstract: This study evaluates the effectiveness of Information Literacy Training (ILT) for academic staff and postgraduate students in the digital era. A descriptive mixed-method approach was used, with data collected from 87 postgraduate students, academic staff, and librarians from nine Campuses across the University of Rwanda. The results showed that providing ILT at the beginning of student's study program significantly enhanced their capacity to identify, access, evaluate, and use information effectively. It also improved students' competencies in research and scholarly publishing. The study highlights the importance of ILT evaluation in training, providing critical insights into program effectiveness, efficiency, and long-term impact. It recommends ILT as a mandatory component in the curriculum for all students.

1. Introduction

Information literacy competencies are critical in the digital age; developing information literacy skills is considered one of the prerequisites for becoming a lifelong learner, and having IL skills has become a significant issue in many academic communities. Information literacy is "a set of abilities requiring individuals to recognise when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (American Library Association, 2000: Pg.2). Information Literacy is also defined as the ability to adopt appropriate information behaviour required to obtain, through whatever

channel or medium, information well fitted to information needs, together with a critical awareness of the importance of wise and ethical use of information in society (Webber & Johnston, 2017).

Similarly, "information literacy" can describe how a person manages the current exponential increase in information and the electronic/computerised access to that information (Johnson, 2008: Pg.104). Thus, an information-literate person, according to Doyle (1992 *p.2),* is referred to as one who recognises:

- *1) "That accurate and complete information is the basis for intelligent decision-making, the need for information; 2)Formulates questions based on information needs; 3)Develops successful search strategies; 4) Identifies potential sources of information; 5) Accesses sources of information; 6)Evaluates information;*
- *Organises information; 7)Integrates new information into an existing body of knowledge; and 8)Uses information in critical thinking and problem-solving."*

Research has revealed that the emergence of the digital era and acknowledged-based societies, the transformation of information into an economic resource, the rapid technological advancements, the proliferating information resources, and the escalating complexity of the information environment have made Information literacy increasingly important (Adekunle, 2019; Association of College & Research Libraries (ACRL), 2000; Webber & Johnston, 2017). Furthermore, research suggests that information literacy can play a vital role by providing students and academic staff with the knowledge and skills required to transform today's information society into the learning society of tomorrow (Bruce, 2002; Webber & Johnston, 2017). However, research reveals that although information literacy plays a crucial role in fostering critical thinking, many academic staff and administrators have not fully recognised the value of library-based information literacy to the academic communities (Bruce, 2002; Edwards et al., 2004; Eisenberg, 2008; Streatfield, 2008; Webber & Johnston, 2017). The current study sets out to close this gap.

Despite the heavy investment in ILT and a solid commitment to providing such training, scant attention has been paid to evaluating Information Literacy Training conducted to establish its contribution to academic outcomes. In addition, little attention has been paid to identifying shortcomings and bottlenecks of ILT, which in some cases has undermined ILT's potential to facilitate the development of academic writing competencies among academic staff and postgraduate students.   The current study set out to address these gaps.

1.1 Problem statement

Although information literacy is instrumental for survival in fast-paced, knowledge-based societies, research has revealed that the value of IL is still little understood by policymakers, including denying that information literacy is even a subject (Adekunle, 2019; Webber & Johnston, 2017); this could stem from the fact that scant attention has been placed on systematic evaluation of information Literacy training to provide evidence about ways in which Information Literacy has been contributory in enabling students and academic staff to thrive in the information society. Where such evaluation has occurred, it lacks systematic evaluation of merit or worth as it focuses on participants'

reactions gathered through questionnaires at the end of information literacy training workshops (Guskey, 1999). Consequently, research reveals a pressing need for more rigorous research on the overall value of library-based information literacy work to the academic communities (Streatfield, 2008). This study aimed to evaluate the effectiveness of ILT for academic staff and postgraduate students.

1.2 Objectives of the study

i)   Establish the Postgraduate students' and academic staff's perceptions of their information literacy knowledge, skills, and competencies for teaching, learning, and research before and after participating in Information Literacy Training (ILT).
ii) Determine how Postgraduate students, Librarians, and academic staff who participated in Information Literacy training workshops applied the knowledge and skills acquired to teaching, learning, and research.

2. Literature Review
2.1 Information Literacy
Information Literacy has been defined as the ability to adopt appropriate information behaviour required to obtain, through whatever channel or medium, information well fitted to information needs, together with a critical awareness of the importance of wise and ethical use of information in society (Webber, S. and Johnston, 2017). Information literacy encompasses library user education, information skills training and education, and those areas of personal, transferable, or 'key' skills relating to the use and manipulation of information in the context of learning, teaching, and research issues in higher education (Streatfield, 2008: Pg. 102).

The current study adapted Doyles'(1992) model that takes the working definition of information literacy and teases aspects of its meaning in a way that has proven helpful to educators worldwide. Doyles' (1992) model describes an information-literate person as one who recognises that accurate and complete information is the basis for intelligent decision-making, recognises the need for information, formulates questions based on information needs, identifies potential sources of information, develops successful search strategies, accesses sources of information, evaluates information, organises information, integrates new information into existing knowledge, and uses information in critical thinking and problem solving (p.2). Based on this model, learning to be information literate involves acquiring and demonstrating these attributes. Hence, the model was suitable for the present study, which aimed to determine the information literacy skills acquired by participants and evaluate how these skills were put into practice in teaching, learning, and research contexts.

2.2 Evaluation of Information Literacy Training (ILT)
Evaluation, defined as the systematic investigation of merit or worth, can be categorised as planning, formative, or summative evaluation (Guskey, 1999). Critical evaluation of professional development in information literacy training

could involve considering the participants' reactions, learning outcomes, organisational support and change, participants' use of new knowledge and skills, and student learning outcomes collectively offer a comprehensive understanding of the program's impact(Guskey, 1999; Streatfield, 2008).

Unfortunately, findings in educational research reveal that the evaluation of Continuous Professional Development (CPD) is frequently not conducted systematically. Often, evaluations assess an activity's entertainment value rather than its inherent quality or value. Additionally, many professional developers have shown little interest in evaluation, viewing it as a costly and time-consuming process that distracts attention from crucial planning, implementation, and follow-up activities (Guskey, 1999).

 Similar practices are observed in Librarianship where the success (or otherwise) of librarian Continuous Professional Development (CPD) is often assessed through evaluation forms distributed at the end of a course or workshop that gather participants' self-reported opinions of the content and facilitation of the learning event as opposed to the evaluation of participants' use of their learning in a workplace situation for purposes of establishing the value of the CPD (Campbell-Meier & Goulding, 2021).

 The limited emphasis on systematic investigation of merit or worth of CPD has created a serious gap, particularly in Information Literacy Training, which could explain why many academic staff and administrators have not fully recognised the value of library-based information literacy to the academic communities. The current study sets out to rectify this gap to fully unlock the potential of Information Literacy Training programs in the constantly evolving landscape of information use and accessibility.

2.3 Theoretical framework

The current study adapted levels 1-4 of Guskey's (2000) framework to evaluate the information literacy training workshops conducted for postgraduate students and academic staff in 2017-2018. The key elements included participants' reaction to information literacy training, participants' learning in terms of new knowledge, skills, organisation Support and Change, including ways in which the University of Rwanda provided a concussive research environment, as well as ways in which the knowledge and skills acquired from Information Literacy training were applied to teaching learning and research. Level five was not employed to evaluate outcomes such as a change in the quality of teaching, learning, and research, quality of research output, and evidence of engagement in lifelong learning required having a control group, which was out of the scope of this study. These levels are:

Level 1: Participants' Reactions: At this level, the evaluation focused on how postgraduate students reacted to Information Literacy training, including aspects like:

i) Whether they felt their time was well spent; ii) Whether the content and materials were appropriate for them; iii) What they thought about the duration of the training; iv) What they thought of the facilitator; v) Whether they thought the Information Literacy training was useful

Level 2: Participants' Learning: At the second level, the evaluation generated data on participant gains regarding new knowledge, skills, and understanding. Questions here focused on:
i) Increased understanding; ii) Higher confidence; iii) new ideas; and iv) Potential or likelihood of applying the knowledge and skills acquired from Information Literacy training to teaching, learning, and research. This level involved assessing the extent to which postgraduate students and academic staff had acquired new knowledge and skills related to Information Literacy by conducting pre-and post-training assessments to measure their learning outcomes.

Level 3: Organization Support and Change: At this level, the evaluation focused on establishing the extent to which the University of Rwanda provides a concussive research environment, particularly the availability of computers, Internet connectivity, and policies that support participants in applying knowledge and skills acquired from Information Literacy training to teaching learning and research.

Level 4: Participants' Use of New Knowledge and Skills: At this stage, the evaluation sought evidence of applying knowledge and skills acquired from Information Literacy training to teaching, learning, and research.

Guskey's (2000) framework was adopted to guide the evaluation of information literacy training because it has been used extensively to assess teacher CPD since it was first published in 2000 and is robust. Despite its usefulness, libraryand information scientists have nit applied Guskey's (2000) framework in evaluating information literacy training. The current study closed this gap using Guskey's framework for evaluating Information Literacy Training at the University of Rwanda.

3. Methodology

A descriptive mixed-method approach encompassing both the quantitative survey elements (closed-ended questions) and the qualitative components (open-ended questions) was adopted for the current study, which set out to evaluate Information Literacy Training workshops that were conducted for postgraduate students, academic staff, and Librarians across the nine campuses at the University of Rwanda in the academic year 2017-2018. The design of the questionnaires was guided by Guskey's (2000) framework, which provided the lens through which to evaluate Information Literacy Training, including the participants' reactions, participants' evaluation of their learning, participants' views of organisational support in information literacy and participants' use of new knowledge and skills for teaching learning and research. The questionnaire included closed-ended questions, which facilitated the systematic collection of numerical data and open-ended questions which generated in-depth, narrative responses from participants and provided rich insights into their experiences, perspectives, and suggestions on information literacy training.

Data was collected using an online cross-sectional questionnaire with closed-ended and open-ended questions designed on Google Forms. The questionnaire was initially emailed from May 2019 to June 2019 to Academic staff, Librarians

and Postgraduate students who had participated in Information Literacy training (which equipped participants with knowledge and skills in accessing e-resources and other information resources for teaching, learning, and research; effective searching; conducting effective literature reviews; as well as the use of Mendeley reference management software for citation and reference Management) in the academic year 2017-2018. Data collection was enhanced by an information literacy evaluation retreat conducted in the last week of June 2019. Participants were guided to the questionnaire link and encouraged to open the link and complete the survey. The participants engaged in a single data collection session. They simultaneously responded to a combination of closed-ended quantitative and open-ended qualitative questions, and 81 online questionnaires were returned.

The study took into accont ethical considerations by providing a brief description of the study at the beginning of the questionnaire, followed by a request to participants provide informed consent before filling in the questionnaire. Furthermore, participants were assured that their responses would be anonymised and kept confidential. In addition, data was stored by the principal investigator on a password-protected computer.The responses were automatically saved in Google Drive, where the initial data analysis was done automatically. . The quantitative data was analysed using descriptive statistics, such as frequency distributions and percentages. Furthermore thematic analysis was employed during the analysis of qualitative data from open-ended questions to identify recurring patterns, themes, and insights from qualitative data.These helped to triangulate findings from closed-ended questions.
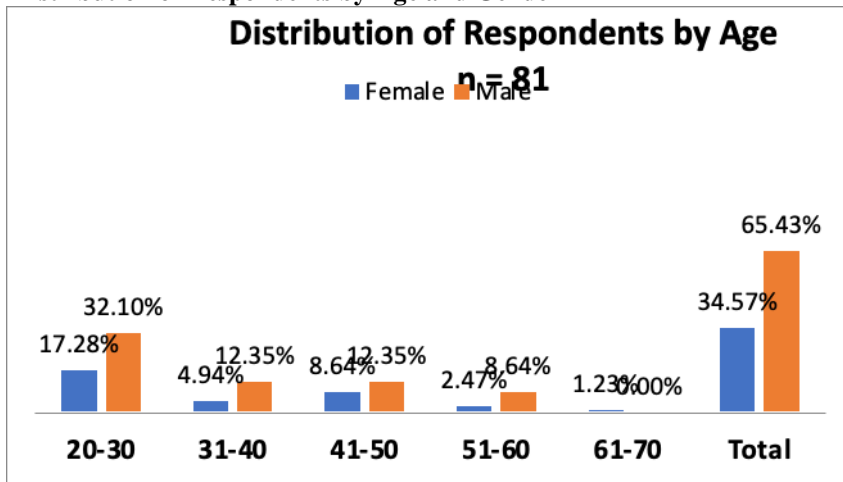
4. Findings

The findings reported in this paper are based on objectives 1) which set out to establish the Postgraduate students and academic staff's perceptions of their information literacy skills and competencies for teaching, learning, and research before and after participating in Information Literacy Training (ILT); 2) to determine ways in which Postgraduate students, Librarians, and academic staff had applied the knowledge and skills acquired from Literacy training to teaching, learning, and research. The findings of the study are presented under four main subsections. The first subsection presents findings on the participants' demographic information; the second subsection presents findings on the participant's perceptions of their competencies and skills in accessing and using e-resources for teaching, learning, and research before and after Information Literacy training; the third subsection reports findings on ways in which the knowledge and skills acquired from Information Literacy training were applied to teaching, learning, research; the fourth subsection presents suggested improvements for Information Literacy Training.

5.1 Distribution of Respondents by Age and Gender

Data analysis revealed that 81 respondents participated in the current study, of whom 34.57 % were female while 65.43% were male.   The data analysis also revealed that the respondents were predominately young, with over 49% in the

age bracket between 20 and 30 years, while only 1% of the participants were over 60 years old.

Figure 1

 Distribution of Respondents by Age and Gender

Distribution of Respondents by Age
■Female   n=81   ■Male

65.43%

32.10%

34.57%

17.28%

12.35%   12.35%

8.64%   8.64%

4.94%

2.47%

1.23% 0.00%

| 20-30 | 31-40 | 41-50 | 51-60 | 61-70 | Total |

5.2 Distribution of Respondents by Category

From the graph below, data analysis indicated that 16% were PhD students, 17% were Masters Students, 21% were academic staff, 11% were library staff, while fourth-year undergraduate students were 34%.

Figure 2
Distribution of Respondents by Category

5. 3. Distribution of respondents by area of research

 The data analysis on the respondents' distribution by research area indicates that over 58% of the participants were from the STEM research disciplines, as shown in Figure 3 below. The distribution of participants within fields by gender indicates that more males participated in IL training than their female counterparts; the results could be explained by fewer female academics in UR (University of Rwanda, 2018).

Figure 3
Distribution of Respondents by Area of Research
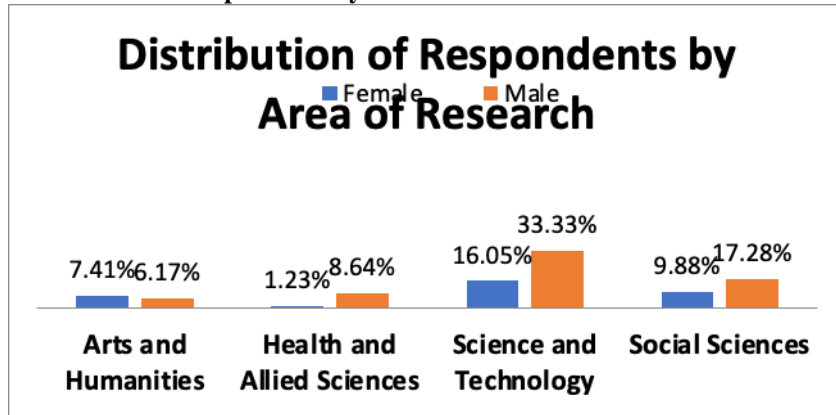
5.4 Distribution of Respondents by Campus

The data analysis revealed that all campuses were represented in the study, and the number of participants was slightly proportional to the population size of the campuses, as reflected in the University of Rwanda (UR) facts figures (University of Rwanda, 2018).

Figure 4
 Distribution of Respondents by Campus
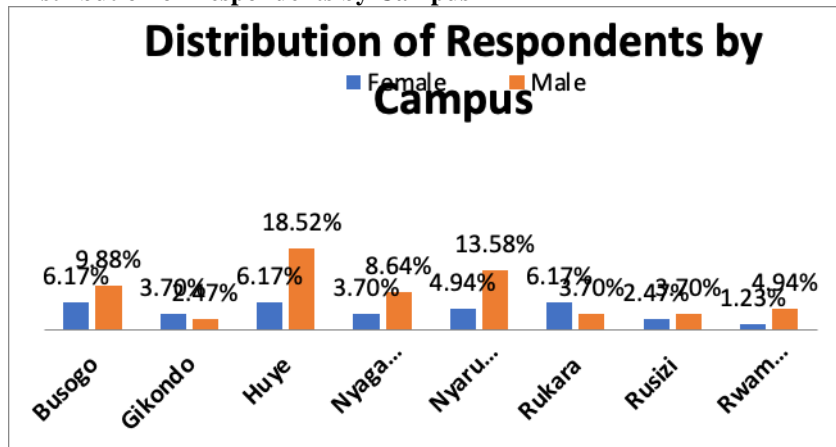
.5 Academic staff and postgraduate students' evaluation of their learning

The analysis of data on staff and postgraduate students' evaluation of their learning revealed a remarkable change in the academic staff and student's knowledge, skills and competence in accessing and evaluating e-resources and other information resources available at UR; conducting effective searches and literature reviews as well as using Mendeley for citation and reference management after participating in information literacy training. For instance,

82% of the participants reported that it was easy to use Mendeley after participating in the   IL training, as opposed to 80% who reported extreme difficulty in using Mendeley before participating in information literacy training workshops.   Figures 5 and 6 provide details of the participants' evaluation of information literacy competencies before and after the training, respectively.

Figure 5
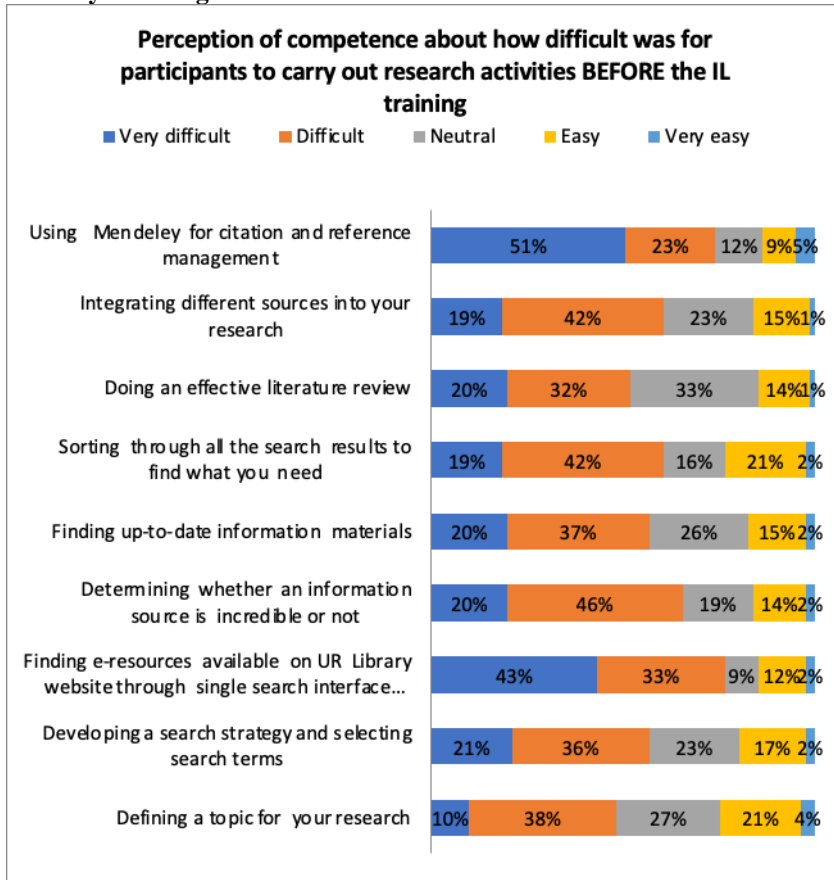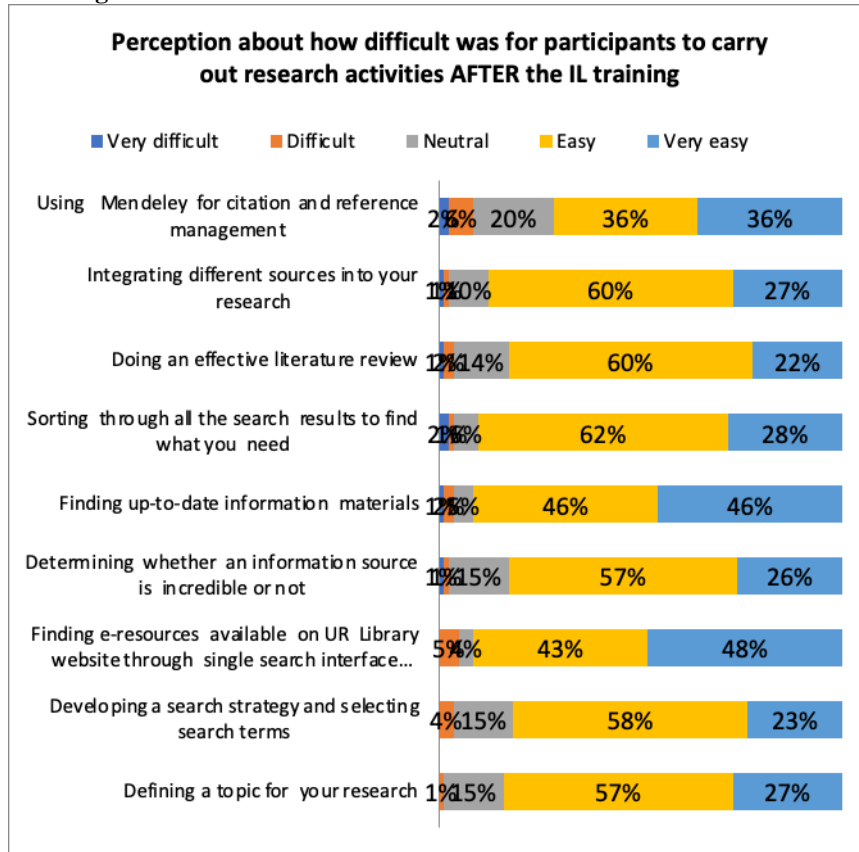**Rating of Competence in Research Activities BEFORE Information Literacy Training**

Figure 6
Rating of Competence in Research Activities AFTER Information Literacy Training

Perception about how difficult was for participants to carry out research activities AFTER the IL training

5.4 Application of knowledge and skills acquired from Information Literacy training in teaching, learning, and research

Data analysis from open-ended questions revealed that academic staff and postgraduate students applied the knowledge and skills acquired from Information Literacy (IL) training to various research activities. Respondents reported using the newly acquired skill to write high-quality assignments, conference papers, research proposals, journal articles, dissertations, and theses. These extracts were selected to illustrate this:

"… I have utilised knowledge obtained in IL training for my final year research project related to hand hygiene knowledge of nurses."

"*…I used the skills in writing my research proposal and a research paper which was accepted and published by IEEE Xplore Digital Library.*" Another participant mentioned, "*2 papers have been published.*"

Additionally, participants mentioned how the training equipped them with knowledge and skills to use resources like LibHub Discovery Service to search

for relevant e-resources from the University of Rwanda Library. They found these skills particularly valuable in conducting effective literature reviews. This extract was selected to illustrate this:

I am sure that I will no longer get stuck searching for useful information needed while writing a literature review or whatever in a scientific way."

"*I have been able to search for articles needed easily, sort out the relevant articles for my research, identify a gap through the literature review, and simplify my proposal write-up.*"

The respondents reported that participating in the training equipped them with knowledge and skills to use Mendeley for citation and reference management. One participant noted that:

"*.… I use Mendeley for citation and referencing in all my publications.*"

In summary, participants' responses highlighted the tangible and lasting impact of Information Literacy training on their research capabilities as they successfully applied these newfound skills to various academic pursuits, from writing papers to effectively accessing and managing e-resources.

5.5 Suggestions for Improvement of Future Information Literacy Training

The evaluation generated rich insights into ways to improve future Information Literacy (IL) training. These are discussed below:

5.5.1.Broaden the scope of future information

Data analysis revealed the respondents' desire to broaden the scope of future information literacy (IL) training sessions. For instance, they expressed the need for training in data analysis software such as Genstat, SPSS, and Atlas Ti, as well as presentation skills, grammar checking, mastering the art of writing research papers, guidance on formulating research questions and hypotheses, identifying predatory journals, and utilising tools like Turnitin to detect and prevent plagiarism. The extracts below were selected to illustrate this:

"*I need to have more skills in writing the review of literature and other parts of research reports or theses and other papers to be published.*"

"*I need more training in using Mendeley in citing and referencing and using the PSS system in data analysis, and I need you to teach us how to formulate research questions and hypotheses.*"

The findings above underscore the need for comprehensive IL training that goes beyond the basics and addresses the diverse skill sets required for successful academic research.

5.5.2 Allocate more time for information Literacy training

While participants found IL training beneficial, there was a consensus that the limited duration of the sessions hindered their ability to grasp all the content fully. The data analysis revealed that allocating more time for information Literacy training would enable participants to delve deeper into the material, engage in practical exercises, and acquire a more robust set of skills. The extracts below were selected to illustrate this.

"*In general, the training was more helpful, but I can say next time that we need adequate time for more skills to be acquired, like maybe five days.*"

"*…would like to request you to give us many days for training so that we can gain more skills.*"

The importance of adequate time allocation for training is evident in the participants' feedback, and the need for a more comprehensive and immersive learning experience.

5.5.3 Incorporate IL training into the academic curriculum and make IL mandatory for all students

The data analysis revealed a strong preference for incorporating IL training into the academic curriculum, particularly collaboration with lecturers teaching research methodology courses, which was recommended to ensure seamless integration and alignment with academic requirements. These extracts were selected to illustrate this:

"…. include information literacy in the research methodology module to collaborate with the lecturers teaching the research methodology course."

"…Constant Literacy training for new postgraduate students (masters and PhD) and new Academic staff."

The analysis of data further revealed that respondents expressed the need to make IL mandatory for all students:

"…students should undertake this training before working on their memoir projects."

"… make the use of Mendeley mandatory for theses and final year projects."

These suggestions underscore the importance of weaving IL training into the fabric of academic programs, making it an integral part of students' research preparation.

5.5.4 Advocate for Reliable Internet Connectivity

The findings revealed that the participants encountered significant challenges from unreliable internet connections during their IL training resulting in a notable decline in the quality of ILsessions.

The selected excerpts highlight the significance of this concern:

"…before preparing for the IL training, it is better to ensure the availability of internet connectivity in various Campuses where some campuses don't have good internet". "Install a strong internet connection."

The suggestions for future Information Literacy training, supported by participant quotations, emphasised the need for a more comprehensive skill set, extended training durations, integration of Information Literacy Training into academic curricula, and addressing ICT infrastructure challenges.

6.0 Discussion of Findings

The results suggest that the approach to the evaluation of Information Literacy Training was successful as it shed light on the value of Information Literacy (IL) training among participants by amplifying the participants' utilisation of acquired skills with notable impacts on research output and efficiency. The findings from this evaluation have gone a long way in providing evidence that is required to galvanise the importance of information literacy by spotlighting ways IL training played a pivotal role in enhancing the participants' research productivity. For instance, several respondents reported the successful completion and publication of academic works such as research papers and

conference submissions following their participation in IL training. These outcomes signify that the ILT not only imparted theoretical knowledge but also equipped participants with practical skills that directly contributed to the quality and success of their research outputs. The findings align with the fundamental purpose of IL training, which is to empower individuals with the tools necessary for effective research and information utilisation for lifelong learning (Bruce, 2002; Eisenberg, 2008).

The current study has extended our knowledge in the field of information literacy by spotlighting ways in which employing Guskey's (2000) framework of evaluation can improve the quality of information literacy training by providing a standard approach that IL trainers can adopt to not only obtain participants' immediate feedback and satisfaction but all assess participants' learning, involving the measurement of knowledge and skill acquisition; organisational support and change, evaluating the impact on organisational dynamics and positive changes; participants' application of new knowledge and skills, scrutinising practical implementation; all of which are vital in assessing the program's quality of the training and also establish future ILT needs.

The point of departure in the information literacy field is where Guskey's (2000)evaluation framework has received scant attention, and much of the evaluation has focused on obtaining participants' reactions rather than the quality worth of the training. (Campbell-Meier & Goulding, (2021) The study has revealed that evaluation is an indispensable component of Information Literacy (IL) training because of its great potential to provide critical insights into the effectiveness, efficiency, and long-term impact of these programs.

The study has also provided evidence about the enduring value of IL training, as demonstrated by participants' continued use of acquired skills; this has underscored the need for ongoing monitoring and evaluation of Information Literacy training programs to ensure that students and researchers are equipped with Information Literacy skills required to thrive in an increasingly complex world of information and research. Evidence regarding ways in which information literacy training enhances information literacy skills has also revealed that educators should not only be concerned about making information technologies available and creating learning activities that require engagement with today's ICT environment, Bruce, (2002) but should also ensure that today's learners are empowered to learn and to take their place in the learning society.

7. Contributions and conclusion

The study generated evidence-based insights that could serve as a blueprint for institutions striving to fortify their commitment to ILT and improve their academic environment. The study highlighted the enduring value of IL training for academic progress and lifelong learning and points to the following implications for theory, practice, and policy.

7.1 Implications for Theory

7.1.1 Adopt Guskey's (2000) framework of evaluation for Library and Information Science

The study advocates incorporating Guskey's five-level framework into future information literacy training programs. This framework allows for the systematic assessment at different levels: participants' reactions, participants' learning, organisational support and change, participants' application of new knowledge and skills, and student learning outcomes. It is anticipated that by adopting this approach, the training programs can gather immediate feedback and satisfaction, measure knowledge and skill acquisition, assess the organisational impact and positive changes, scrutinise practical implementation, and emphasise the ultimate implications for participants. This approach will facilitate real-time tracking, identification of strengths and weaknesses, alignment with learning objectives, and continuous improvement to ensure participants develop the critical skills required to survive in the dynamic information landscape.

7.2 Implications for Practice

7.2.1. Collaboratively design an information literacy training module

The evidence from this study is a call to action for faculties, schools, departments, Libraries and the Consortium of Uganda University Libraries to collaboratively design, implement and evaluate information literacy training modules to equip students and academic staff with information literacy skills needed for success in the information-rich academic world.

7.2.2 Academic Staff Training

This study advocates for creating targeted academic staff Information literacy programs designed to equip educators with vital Information Literacy (IL) skills and inspire and empower them to seamlessly incorporate IL concepts into their courses.

7.2.3 Foster Inclusivity and Accessibility in Information Literacy

The insights derived from this study underscore a critical imperative that Information Literacy (IL) training is not just a privilege but an accessible right for all students. The study emphasises that Information Literacy (IL) training must be accessible to individuals with disabilities and those with diverse learning needs.

Furthermore, a holistic approach that accommodates a spectrum of learning styles and preferences should be adopted, cultivating an inclusive educational environment where every learner can thrive.

7.2.4 Embrace Technological Integration

The findings strongly assert that universities should be committed to investing in cutting-edge technology infrastructure. This investment is essential for seamless and equitable access to vital resources and tools that students and academic staff require to thrive in the digital age.

7.3 Implications for Policy

7.3.1 Policy formulation

These findings emphasise the need for universities to develop clear and comprehensive policies accenting the significance of Information Literacy (IL) in enhancing teaching, learning, and research. These policies should be

seamlessly integrated into the institution's overarching educational strategy and effectively communicated to all stakeholders, including academic staff, administrators, students, and librarians, to ensure widespread awareness of the institution's steadfast commitment to IL training.

7.3.2 Policy review

The study also strongly advocates establishing a structured framework to systematically review and update institutional IL policies and practices; this approach is anticipated to help universities stay abreast of evolving educational trends and the ever-advancing realm of technology, thus ensuring a responsive and forward-thinking approach to IL training.

7.3.3 Institutionalisation of Information Literacy

The findings of this study propose that Information Literacy (IL) training should be integrated into the institution's curriculum and academic framework and elevated to the status of a mandatory credit-rated requirement for every student to ensure that students and researchers are equipped with Information Literacy skills and are well-prepared to navigate the complexities of today's information landscape.

Conclusion

Hence, it can be argued that the assessment of Information Literacy Training holds significant importance for institutions in guaranteeing that students and faculties can effectively navigate, evaluate, and utilise information within a progressively intricate and ever-changing information environment. However, future research could focus on the importance of planning and formative and summative evaluation of Information Literacy Training outcomes.

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