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Narratives of Students' Digital Literacy Skills: Level of Skills, Actual Use of ICTs and Pedagogical Support

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ABSTRACT

Various efforts have primarily focused on policy and infrastructure, with little emphasis on instructional approaches to enhance digital literacy preparedness. Thus, the study examined the narratives surrounding students' Digital Literacy Skills and the associated pedagogical approaches aimed at supporting their development. The investigation was limited to Mzumbe University to justify the current initiatives promoting graduates' 4.0 IR skills. A convergent mixed-method design was employed, utilising interviews, focus group discussions, documentary review and questionnaires for data collection. The study used thematic analysis and descriptive analysis methods to interpret the collected data. Framed by the conceptual framework of 4IR skills (operational and informational skills), the findings reveal that most students rated their ICT operational skills as above average. In contrast, instructors perceived deficiencies in these same skills. The study also reports inconsistent use of ICTs among both students and instructors, which may compromise students' acquisition of digital literacy skills. Furthermore, this article identifies limited pedagogical practices dedicated to enhancing students' Digital Literacy Skills for learning at the University and a lack of a clear institutional framework supporting skill development in this domain. Based on these findings, practical and policy implications suggest challenging existing frameworks, such as the 2014 Education and Training Policy (2023 version), the National Digital Education Strategy (2024-2030), the 2016 National ICT Strategy, and the SDGs (4 and 10).

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INTRODUCTION

Digital Literacy Skills for graduates' form one of the core Fourth Industrial Revolution (4IR) skills, essential not only for enhancing students' learning at universities but also for graduates' employability and lifelong learning in workplaces (Mgaiwa, 2021). The sophistication and advancement of technological innovations have altered the knowledge required for the labour market (Didier, 2024). Given these technological demands, various reforms in Tanzania have aimed to enhance digital literacy, among other objectives. Some of these include the development of the National Digital Education Strategy for Tanzanian Schools (United Republic of Tanzania, 2025a). Such projects represent attempts to create a supportive Information and Communication Technology (ICT) learning environment and promote graduates' 4IR skills and employability. Hwang (2017) acknowledges that graduate unemployability is a focus of debates and research in Higher Learning Institutions. The number of graduates who penetrate the labour market and secure jobs represents a small proportion compared to those who graduate annually, where, among others, substantial evidence indicates that a large aggregate of university graduates is unemployable due to a lack of required competencies in crosscutting areas of their degree programmes (Kibona, 2024; Mseleku, 2024). Graduates complete their studies with weak, unsatisfactory educational outcomes and lack critical skills to access job offers in the labour market (Amani, 2017; Monga et al., 2019). Although university curricula play a vital role in determining graduate employability, teaching approaches must embrace technology to reflect the ever-changing context of Society (Demissie et al., 2021). According to Monga et al. (2019), one reason for the incompetence of graduates is that technologically ill-suited pedagogies fail to prepare them to cope with rapidly changing technological developments, which contributes to graduate unemployment. Furthermore, technological challenges in training institutions and the low level of ICT skills among graduates hinder the teaching and learning process, resulting in graduates who are incompetent in their specialisations (Ndyali, 2016).

Clamours about curricula have also persisted in Tanzanian universities despite some indicators of continued reviews and updates to accommodate labour market and societal needs. Further indicators confirm universities' strides to integrate Information and Communication Technology (ICT), both as a subject and as a pedagogical approach. According to the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2018), this integration should impact graduates' Digital Literacy Skills for lifelong learning and employability. Besides other skills, Monga et al. (2019) cite technological skills as requisites for graduates to operate in a digital environment compatible with the labour market. In the context of students' learning, a lack of technology or digital literacy skills is likely to jeopardise the authenticity of learning (UNESCO, 2018).

Additionally, the absence of such skills would create turbulent conditions for graduates in the labour market (Organisation for Economic Co-operation and Development [OECD], 2018). The current study aligns with Tanzania's Development Vision 2050, which emphasises that Higher Learning Institutions (HLIs) are central to developing graduates with the skills required in the labour market (United Republic of Tanzania, 2025b). They are expected to be proactive in implementing their curricula in relation to technological changes and in helping governments adopt appropriate technology in development endeavours (United Republic of Tanzania, 2023).

In Tanzania, plans for the adoption of ICT in universities began in the 1990s, when the University of Dar es Salaam started developing ICT master plans and policy in 1995 (Lwoga et al., 2004). Currently, most universities are equipped with ICT facilities and infrastructure for teaching and learning. In line with UNESCO (2018), the focus is to promote field-specific competencies and Digital Literacy Skills among graduates

(Mtebe & Raphael, 2017). However, despite efforts such as enacting ICT policies and capacity building aimed at creating ICT awareness, literacy, and expertise in Tanzania's universities since the 2000s (Semlambo et al., 2022), the uptake of ICT in teaching and learning has been fluctuating (Bećirović, 2023). Studies have identified factors that affect the sustainable use of ICT, including limited infrastructure and facilities, resistance to new technologies, and incompetence in technology use, among others (Semlambo et al., 2022). To leverage the potential of technology, universities in Tanzania have worked to address these challenges through capacity-building training, updating ICT systems, and employing experts (Mtebe & Raphael, 2018). Mzumbe University launched initiatives in 2008 to create a supportive environment for the use of ICT in teaching and learning (Ghasia & Magogo, 2013). Overall, universities in Tanzania have begun offering blended programmes, which necessitate not only additional investment in ICT infrastructure but also the Development of Digital Literacy Skills for both instructors and students (Tanzania Commission for Universities, 2022). Citing the National Digital Education Strategy (URT, 2025a), universities are expected not only to emphasise investment in ICT infrastructure but, more importantly, to implement supportive pedagogies, such as blended, student-centred, and digitally collaborative approaches, that actively build students' operational and informational competencies.

Despite commendable attempts to implement technology use in teaching and learning, studies have not explored the available support for students' acquisition of Digital Literacy Skills (DLSs) (Barakabitze et al., 2019; Mgaiwa, 2021). This gap makes it difficult to justify the University's achievements in implementing ICT for students' learning on one hand and the quality of graduates in relation to labour market needs on the other (Luhanga, 2019). Challenges such as inadequate infrastructure, instructors' workload, and ICT-unfriendly backgrounds have made the optimal acquisition of Digital Literacy Skills in Tanzanian universities questionable (Barakabitze et al., 2019; Mtebe & Raphael, 2018). For instance, attempts to orient students in computer use remain techno-centric, where ICT is taught as a subject to be assessed at the end of the semester (Nalaila et al., 2022; UNESCO, 2018). Under such circumstances, research is called to investigate instructors' support for students' Digital Literacy Skills. Such studies should establish the extent to which support is planned and coordinated, as well as the instructors' level of pedagogical preparedness. Key areas emerging as critical for study include whether the available teaching and learning experiences nurture students' Digital Literacy Skills for learning.

Digital Literacy Skills for learning define students' capacity to access, create, share, analyse, collaborate, evaluate, think critically, innovate, and communicate digital information in an ICT environment (OECD, 2018; UNESCO, 2018). The design, implementation, and assessment of students' learning activities must consider the need for students to acquire these skills (Handley, 2018). Students without such skills in universities that use ICTs face difficulties adapting and learning with ICTs (Reddy et al., 2022). They commit academic dishonesty, struggle to transfer learning, are unable to cite and quote browsed material, lack internet navigation skills, and fail in presentations (Nalaila & Elia, 2024). These attributes suggest that such students may not achieve the quality learning outlined in Sustainable Development Goal (SDG) Target 4, as Luhanga (2019) posits. A gap remains in understanding how instructors' pedagogical support nurtures students' development of digital literacy skills for the 4IR, as efforts primarily focus on policy and infrastructure, with less emphasis on instructional approaches to digital literacy preparedness. This study aimed to determine the extent to which pedagogical approaches foster students' Digital Literacy Skills. Accordingly, this paper details students' perceptions of their level of Digital Literacy Skills, how students use ICTs for learning, and the pedagogical support for students' Digital Literacy Skills for learning.

LITERATURE REVIEW

Empirical Literature

What appears to be a consensus in the literature is that access to and understanding of technology in Sub-Saharan HLIs do not exhaustively explain the patterns of technology use. Following this, Reddy et al. (2022) recommend the need to prepare students for learning in an ICT environment, whose absence presents risks such as difficulties in searching and retrieving online information sources; managing and completing online activities (Winter et al., 2010); finding time in the curriculum to develop competence in using technology; and gaps in digital footprints (Micheli et al., 2018). The current move to the 4IR creates a gap in evidence on how universities are navigating the paradigm shift to new instructional approaches that should promote the required soft skills among graduates (Bühler et al., 2021).

The 4IR has brought about significant changes in economies, education, and work, rendering digital literacy skills a necessity. Such changes include increased digitisation of workplaces, automation, artificial intelligence (AI), and the need for continuous learning, among others. These changes have created a demand for various skills to support individuals' navigation of the 21st-century labour market, which differs from the past (Moloi & Mhlanga, 2021). The employment sector demands skills such as problem-solving, interpersonal, and teamwork (Bühler et al., 2021). Additionally, industrial growth requires HLIs to build skills relevant to the 4IR, including digital and technological literacies (Aboderin & Havenga, 2024; Chaka, 2019). Tram and Tri (2021) report that the 4IR has increased the need for soft skills, including the ability to manage independent learning in the digital environment. This aligns with UNESCO's recent recommendation for universities to intensify arrangements to equip youths with operational and informational skills for lifelong learning (UNESCO, 2018).

The current labour force in most Sub-Saharan African countries, as in other regions, lacks soft skills and professional knowledge. The ability to nurture students' digital literacy skills through ICTs is crucial; however, the challenge is amplified when youths and learners cannot effectively utilise digital resources. This justifies a study to investigate students' digital literacy in universities, assessing and addressing their competency gaps. This creates pressure on training institutions to ensure innovative training approaches that help graduates acquire 4IR skills (Monga et al., 2019). The African Development Bank [ADB] (2021) indicated that 47% of training institutions reviewed and updated their curricula less than annually, and less than half provided information on job market conditions to their students. Furthermore, 56% of the surveyed institutions had dedicated programs related to 4IR skills, and 71% had plans to develop or expand such programs by 2025. The literature in the context of developing countries (Tanzania inclusive) does not offer a clear picture of classroom experiences and how such arrangements have impacted students' capacity to learn with ICTs.

Digital Literacy Skills (DLS) encompass a broad set of technology-related competencies needed for effective participation in the 21st-century knowledge society (Tinmaz et al., 2022). Major frameworks, such as UNESCO's Global Reference (2018), the European DigComp, and the ALA definition (2012), converge on core areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving and innovation. However, their orientations differ slightly: UNESCO provides a global policy perspective for monitoring SDG 4.4.2, DigComp is operational in nature, while ALA emphasises informational literacy (OECD, 2019). Beyond education, these frameworks require contextual adaptation to sectoral needs (UNESCO, 2018). In teaching and learning, research shows that students acquire DLSs effectively when embedded in context-specific pedagogies (Wiegel, 2020). Learners who lack such skills

struggle to engage authentically in ICT-supported learning (Ay & Erdem, 2020; Krueger & Moore, 2015; Rahmatirad, 2020; Borokhovski et al., 2018). Instructors' design of learning activities thus critically shapes students' ethical and creative use of digital content (Yu, 2022; Nalaila & Elia, 2024).

Universities are called to design suitable programmes that equip graduates with Digital Literacy Skills for learning and beyond. According to Elayyan (2021), more than 50% of the content in a graduate degree will be obsolete in five years. As such, Higher Learning Institutions (HLIs) must mainstream pedagogies (methods, techniques, and strategies) that train students to operate in the context of the Fourth Industrial Revolution (4IR). This also implies a significant change in teaching methods and in the roles of teachers and learners. With the 4IR, both instructors and students must be able to adapt to and use deep-learning technologies such as robotics, Artificial Intelligence (AI), big data, and the Internet of Things (IoT) (Ally, 2019; Tram & Tri, 2021).

Furthermore, teachers should assume new roles as mentors, researchers, facilitators, designers, creators of learning environments, and catalysts for learning (Nalaila et al., 2022). Indeed, with digitised learning content, learners must be supported in implementing their own learning paths, selecting content suitable for their training goals, and receiving recommendations for additional learning content needed for their development (Tram & Tri, 2021). Where appropriate, a careful blend of traditional and modern methods is imperative. As such, informed studies are needed to recommend the authenticity and sustainability of such a blend, so that learners can acquire knowledge accurately and apply it creatively in practice (Tram & Tri, 2021).

Theoretical Framework

The study draws its theoretical foundation from the constructs of sociocultural learning theory, including the Zone of Proximal Development (ZPD), scaffolding, mediation, artefacts (tools), and interaction (Rahmatirad, 2020; Wang et al., 2011). Additionally, it draws on four constructs from the European Digital Competence Framework for Citizens (DigCompEdu 2.2), specifically digital resources, teaching and learning, empowering learners, and facilitating learners' digital competence (Vuorikari et al., 2022). The two theoretical frameworks intersect in the understanding of learning needs or gaps—ZPD through assessment, providing support for learners to develop digital competence (scaffolding) by utilising available digital resources (artefacts/tools) as they interact in the teaching and learning process. The framework also helps to identify the state of the art required to meet institutional and employers' expectations of digitally competent graduates in the labour market landscape. Given the study's focus on pedagogical approaches and the Digital Literacy Skills dimension, this theoretical framework provides a guide for identifying and interpreting appropriate practices to achieve the objective. Additionally, this framework helps instructors and lecturers understand how to assess gaps and support students' acquisition of Digital Literacy Skills and the authentic use of digital resources for lifelong learning.

METHODS

Research Approach and Design

The research employed a convergent mixed-method design.The design was considered ideal as it provides detailed and balanced information from different angles. It enables the collection of both qualitative and quantitative data concurrently, and the analysis provides a platform for effectively comparing and confirming the findings. A qualitative method allowed for an intensive analysis of individual or multiple cases, as the

focus of the study, while a quantitative method ensured the collection of exhaustive, context-specific, and rich information to uncover realities across a broad spectrum.

The Study Area

The study was carried out at the Mzumbe University main campus to investigate the technology use practices. The University has made attempts to promote e-learning for over 20 years and is currently seeking perspectives to inform further improvement. The Higher Education for Economic Transformation (HEET), a World Bank-funded project, for instance, aims to enhance 21st-century skills for the employability of graduates. As such, various efforts, including research, are desired to justify the ICT investments the University has made, in terms of infrastructure, capacity development, and milestones in the lines of graduates' digital literacy. Furthermore, selection was also informed by gaps in the literature (Almasi et al., 2025; Mtebe & Raphael, 2018; Nalaila et al., 2022), where there is a lack of existing information on the University's pedagogical support for students' Digital Literacy Skills for learning.

Study Respondents

The study involved students of various specialisations and their respective lecturers from each academic unit. These programs and units were LLB (Faculty of Law), BSC ICTB (Faculty of Science and Technology), BPA RAM (School of Public Administration and Management), BAF (BS) (School of Business), and BAED EK (Faculty of Social Sciences). Students were included because they are the central participants and beneficiaries of the pedagogical reforms. For instance, the quality use of ICTs for teaching and learning will be gauged by how learners use the ICTs for learning and how they amplify learning achievement. Furthermore, the inclusion of lecturers draws on their experience regarding students' actual use of technology for learning. It implies their central role in nurturing students with desirable learning styles, particularly in the appropriate use of ICTs for learning. Lecturers also have practical experience with factors hindering students' use of Learning Management Systems (LMSs) and have context-specific information on appropriate measures for improvement.

Sample and Sampling Technique

The study randomly selected one program from each School/Faculty at the main campus. Additionally, a stratified random sampling technique was employed to select one program from all academic units and to choose students from first-year, second-year, and third-year cohorts in each of the selected programmes. All programs had an equal chance to contribute to the study, since they share ICT facilities and infrastructure at the University. Initially, the study aimed to select 60 students per program, i.e., 20 from each year of study in 5 programmes, making a total of 300. Due to concerns about the survey response rate, as reported by Holtom et al. (2022), the study distributed more questionnaires, anticipating that some would be incomplete or not returned, which would not affect the expected number. Hence, a total of 371 questionnaires were obtained. The instructors selected for this study taught a course in the selected programs. A total of 41 lecturers from different academic units at the University, with different ranks, participated in the structured interviews to account for the pedagogical support offered to develop students' Digital Literacy Skills.

Data Collection Methods and Procedures

The data collection process took place between June and November 2024. The study used semi-structured interviews, focus group discussions, documentary review and questionnaires for data collection. The

interview method was used to elicit views and opinions. Questionnaires were administered to 41 instructors and 371 students who completed and returned the questionnaires for analysis. Again, seven (7) instructors who teach in the selected programmes were purposively selected for interviews, and 15 students (class representatives) of the selected programmes participated in focus group discussions (FGD). The study also employed a documentary review, focusing on students' papers and learning correspondences carried out via the Learning Management System. The aim was to confirm the operational and informational attributes of Digital Literacy Skills via instructor and learner interaction.

Data Analysis Plan

The study employed a qualitative content analysis method that involves flexibly reducing the data without distorting the intended original meaning. The process of reducing data focused on retaining the meaning of the aspects that reflect the research questions. After data collection, it was organised, transcribed, sorted out and coded to enable presentation and analysis.The analysis of quantitative data employed descriptive statistics, including percentages, graphs, the Relative Importance Index (RII), and frequency data in tabular form, to establish the frequency of ICT-supported learning activities and pedagogical support. The RII was used to identify the most common and popular pedagogical support accorded to students.

Validity and reliability

The expert review also assessed the interview questions, ensuring they collected the required information for the study. For questionnaires, a pilot study ensures construct validity by verifying the clarity of the items and ensuring response consistency. Researchers estimated the internal consistency of the questionnaire items using Cronbach's Alpha test, which estimated 0.81(81%) consistency of the questionnaire items as summarised in Table 3. A Cronbach's alpha of 0.81 indicates good reliability. Again, 47 questionnaire items consistently measured the same construct related to ICT use.

Table 3: Reliability Statistics

Cronbach's Alpha	No of items
0.81	47

Ethical issues

The study adhered to research ethics as suggested by Creswell and Creswell (2018). Researchers obtained the necessary permits from the relevant authorities and obtained consent from the participants. Respondents were informed about the study's objectives, ensured anonymity and confidentiality of their identities and had the freedom to withdraw at any point.

RESULTS

The study aimed to investigate students' perceptions of Digital Literacy Skills, their actual use of ICTs, and the pedagogical approaches in place to support the development of These Skills. The following sections present the detailed findings related to these specific objectives.

Demographic characteristics of respondents

There is a slight variation in gender, with males 196(52.83%) and females 175(47.17%). In years of study, the second year had more respondents, with the first year having the lowest response rate. Again, the BAF

BS program has more respondents, 122(32.9%), while the BAED EK has the least number of respondents, 44(11.9%), as indicated in Table 1.

Table 1: Demographic characteristics of respondents

S/N	Program	Year of Study	Male (%)	Female (%)	Total
1	LLB	1st	9	9	18
		2nd	21	21	42
		3rd	17	22	39
		Sub-Total	47 (47.47%)	52 (52.53%)	**99 (100%)**
2	BSC ICTB	1st	3	3	6
		2nd	17	10	27
		3rd	9	8	17
		Sub-Total	29 (58%)	21 (42%)	**50 (100%)**
3	BPA RAM	1st	3	3	6
		2nd	19	19	38
		3rd	6	6	12
		Sub-Total	28 (50%)	28 (50%)	**56 (100%)**
4	BAF (BS)	1st	17	14	31
		2nd	28	27	55
		3rd	21	15	36
		Sub-Total	66 (54.10%)	56 (45.90%)	**122 (100%)**
5	BAED EK	1st	10	9	19
		2nd	8	4	12
		3rd	8	5	13
		Sub-Total	26 (59.10%)	18 (40.90%)	**44 (100%)**
	TOTAL		**196 (52.83%)**	**175 (47.17%)**	**371 (100%)**

Source: *Field data (2024)*

Distribution of Lecturers

Out of the reached sample, the majority are Assistant Lecturers (46.3%), whereas Tutorial Assistants (9.8%) and Senior Lecturers (9.8%) altogether formed the minority. Gender-wise, the distribution of instructors presents 23(56.1%) males and 18(43.9%) females, as shown in Table 2.

Table 2: Demographic distribution of lecturers

S/N	Academic Unit	Tutorial Assistant			Assistant Lecturer			Lecturer			Senior Lecturer			TOTAL
		M	F	T	M	F	T	M	F	T	M	F	T	
1	School of Public Administration and Management	0	0	0	1	1	2	1	1	2	0	1	1	**5**
2	School of Business	0	0	0	5	2	7	2	1	3	2	1	3	**13**
3	Faculty of Social Sciences	3	1	4	4	3	7	2	3	5	0	0	0	**16**
4	Faculty of Science and Technology	0	0	0	1	2	3	2	1	3	0	0	0	**6**
5	Faculty of Law	0	0	0	0	0	0	0	1	1	0	0	0	**1**
	TOTAL	**3**	**1**	**4**	**11**	**8**	**19**	**7**	**7**	**14**	**2**	**2**	**4**	**41**

Source: *Field data (2024)*

Students' Perceptions of their Level of Digital Literacy Skills

Firstly, the study examines students' perceptions of their digital literacy skills in relation to learning. The findings reveal that in six (6) out of nine (9) aspects, the majority (above 50%) rated their Digital Literacy Skills as moderately high to high. These aspects include: basic knowledge of computer operations (61.2%), basics of Learning Management System operations (55.6%), skills to search and filter electronic information

(51.8%), producing simple digital content in at least one format using digital tools (54.2%), skills to protect personal data and privacy (52.6%), and ICT skills to operate basic hardware/software for their specialisation (55.2%).

In interviews, findings indicate that the majority of students are familiar with the basics of computer operations, mainly acquired from peer experiences and the daily use of devices like smartphones and tablets:

> In fact, the majority of us can perform the elementary operations of a computer; we only differ in terms of the capability to implement comprehensive activities. Some can do only a few things beyond starting the computer (BPA-RAM 2 student interviewee, 26 May 2024).

Students admitted to encountering difficulties in identifying relevant materials, using up-to-date search strategies for digital materials, and tailoring their search results to learning tasks. One student said:

> It needs much time to search and download documents relevant to the learning task at hand (LLB 3 student interviewee, 20 May 2024).

Students similarly indicate that mastery of the Learning Management System (LMS) operation is not viewed as important because the use of the system is not mandatory; hence, their perception of their skills may be exaggerated.

The majority of students (above 50%) rated their skills as average, low, or non-existent in the remaining three aspects. These aspects are: skills to evaluate electronic information (51.5%), skills to communicate information and collaborate online (54.6%), and skills to create and use digital information ethically (52.8%). The findings indicate that most students lack the informational skills needed to evaluate the quality and authenticity of electronic information and to apply these skills in creating digital content. The responses indicate that many students continue to struggle with analysing, interpreting, comparing, and critically evaluating the credibility and reliability of digital information and content for appropriate tasks. In many instances, they struggle to choose credible materials and content for their learning tasks:

> I acknowledge, most of us are in danger of misinformation and misconception. (LLB student FGD respondent, 23 May 2024).

In interviews, lecturers indicate a technological preference gap between themselves and students, such that students prefer social networks as tools for communication and collaboration. In contrast, lecturers and the University advocate for LMS and email tools. Lecturer 4 stated:

> Students perceive social networks as convenient and user-friendly computer and email tools, which are often regarded as informal at the University. I teach first-year students, and in most cases, the majority do not subscribe to the LMS. I therefore create survey links using other tools, such as SurveyMonkey, that do not require students to have login details, and share them via their social networks (Lecturer 4, interviewed 8 July 2024).

On the dimension of skills for creating and using digital information ethically, lecturers confirmed challenges such as students submitting plagiarism-free assignments:

> The papers our students write manifest some problems in terms of students' capacity to integrate information from various sources (Lecturer 2 interviewed on 9 July 2024).

Further findings revealed that the majority of students rate their capacity to protect personal data as neither academic nor related to students' wellbeing, such as relationships and other undesirable data, including videos and pictures/photos.

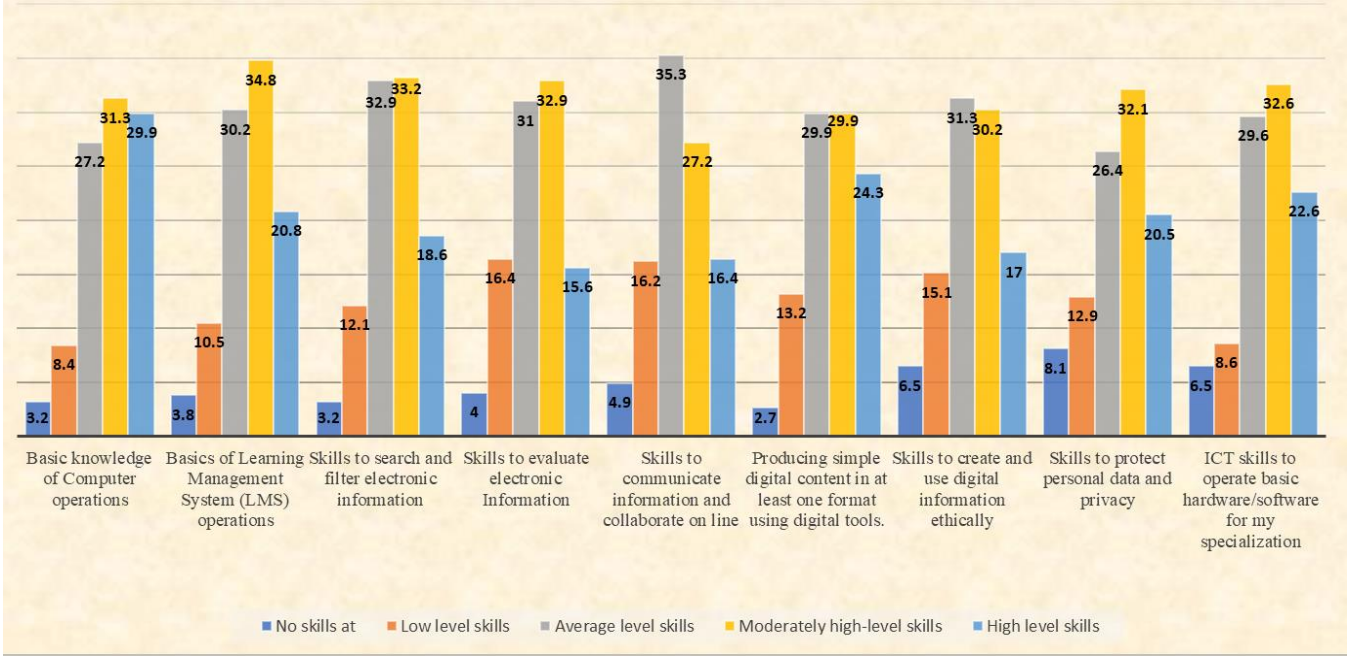

Figure 1: Aspects of Digital Literacy Skills

Source: *Field data*

The Pattern of ICT Use for Learning at MU

The second objective examined how students use ICTs for learning. The focus was to establish the actual classroom uses of ICTs for learning and the regularity of technology use. The findings indicate that lecturers have varying beliefs about the use of ICT in teaching to develop students' Digital Literacy Skills. Some lecturers reported that using ICT in teaching is mandatory in their courses, while others from the same unit said it is optional. However, lecturers' requirements in specific courses indirectly prompted students to use ICT. The analysed findings reveal three patterns of use: self-initiated uses, instructor-driven uses, and non-digital students who never use ICT for learning activities.

Students' self-initiated use of ICT.

The findings confirm that students integrate ICT in learning activities to address assignment needs. Students initiated the use of ICT in activities such as searching for online materials for individual and group learning tasks (77.1%), typing and formatting notes and assignments (64.4%), and conducting online discussions using social networks (55.7%). Lecturers had similar opinions, with 68.3% emphasising students' use of ICT for searching learning materials and 56.1% emphasising students' initiatives to type assignments. However, 44% of lecturers admitted that they did not participate in online discussions through social media, believing these were student-based platforms.

The findings also revealed that the learning environment pushed students to use ICT platforms for learning. For example, students had to search for appropriate reference materials and type and format assignments

for submission as a mandatory requirement. Students further admitted that they use emails and WhatsApp to conduct discussions or communicate after class:

> The learning context forces me to use a computer to search for materials and write assignments. It was costly to use stationery for all assignments. I have seven courses per semester, and each course has numerous assignments. Again, we sometimes need to discuss, but our colleagues live far from here [off campus]. (BAED 3 student – FGD conducted 26 May 2024).

Instructor-driven use of ICT

The findings show that students engaged in learning activities using LMSs as a requirement of lecturers in some courses. For instance, students used LMSs for designing and making PPT presentations (46.9%), accessing open online lectures and tutorials to complement class learning (35.8%), and participating in online discussions and tests through the University LMS (36.6%).

Students' responses confirmed that lecturers provide feedback aimed at improving their skills to learn with ICTs. The majority of such lecturers focus on attributes such as proper design of PPTs, formatting assignments, and understanding online interaction ethics. A student admitted,

> Our instructor frequently requires us to participate in LMS online forums. He always says we should respond with evidence and not mere empty critiques. Also, we should respect what others say, whether we agree or not." (BSc-ICTB student C, interviewed 13 June 2024).

Another student reported that:

> In most courses, lecturers provide us with assignments and want us to present using projectors. This situation forces us to work hard and design PPTs to improve our presentation skills. If you fail to make a good presentation, for example, putting too many words on one slide, having too many slides, or using images or figures without acknowledging them, you get low marks. (LLB 2 student – FGD conducted 23 May 2024).

The majority of students from the BAED-EK and BPA-RAM programs indicated that their lecturers always required them to communicate via email. Some students reported average use of email, while others reported consistent use, with males using it more than females. A class representative in one program admitted:

> I think for many females, they lack interest because of their preconceptions about communicating with teachers. They operate accounts on TikTok and Instagram [social media]. (BPA-RAM 2 student B – FGD conducted 26 May 2024).

Some students admitted that lecturers preferred to use the learning management system. They said that lecturers could identify students participating in any online activity when they use University-managed platforms, making it manageable. Given this fact, nurturing students' ethical use of digital platforms becomes easy and controlled: One respondent from BAF-BS 3 said,

> The instructor told us to use e-learning in all learning activities and communication. No emails are allowed, as some students create fraudulent emails. These students use

fraudulent emails to abuse instructors because it is hard to trace who owns them." (BAF BS 3 - FGD conducted on 26 May 2024).

Non-use of ICTs

Some students reported that they neither used digital tools to participate in online lectures. All students (100%) admitted that they had never sat for university examinations online using an LMS. These findings echo lecturers' responses that they never administered university examinations through online platforms, and many had never conducted online lectures. This indicates low usage of ICT for online lectures. Limited use of ICT affects the development of both operational and informational Digital Literacy Skills.

Students reported that university policies restrict certain online activities, including examinations. Some also suggested that infrastructures are unreliable, especially due to frequent power cuts, unstable internet connectivity, and limited ICT devices to accommodate the available number of students:

> I do not think we can sit for final examinations online, even if the by-laws allowed that. Our infrastructures are not ready for that… (BSc-ICTB student A interviewed on 13 June 2024).

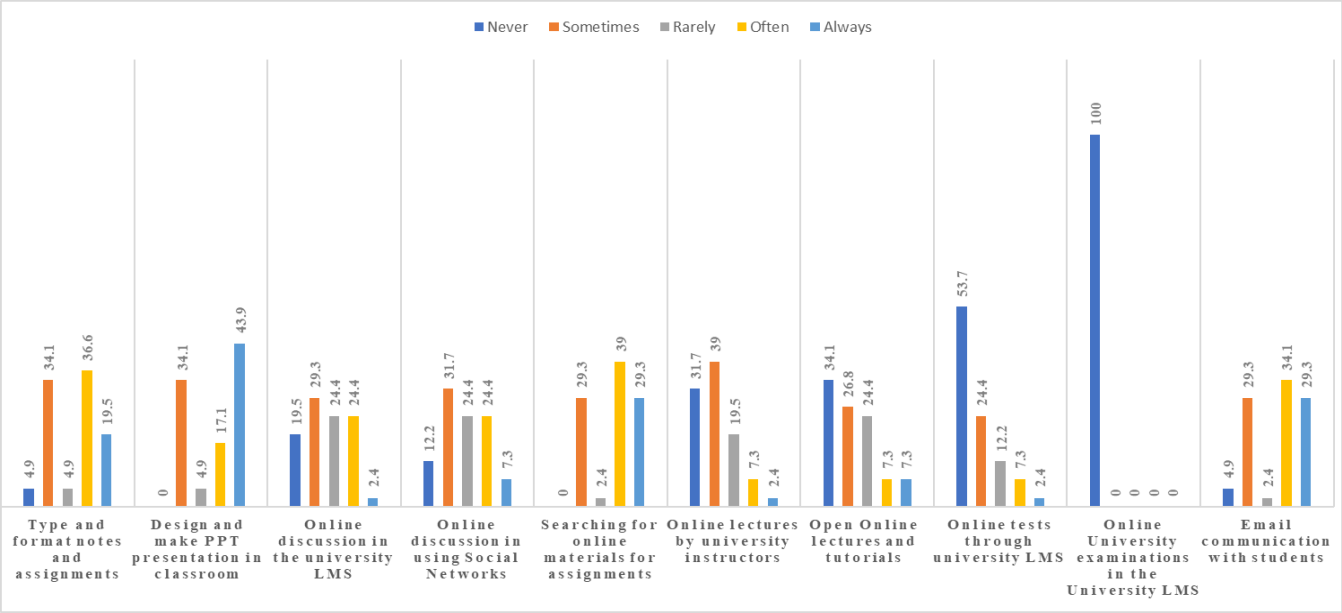

Figure 2: ICT-mediated teaching activities among lecturers

Source: *Field data*

The Relative Importance Index was used to determine the ICT-supported activities that featured most (Table 4). The prominence of some activities has implications for students' mastery and their likelihood of developing Digital Literacy Skills in the long run. Based on the data in Table 4, some activities rank higher than others. The activity that ranks number one, searching for online materials, indicates that it is the most popular ICT-supported learning activity. This also suggests that students are likely to demonstrate higher levels of Digital Literacy Skills in activities that are featured most frequently.

Table 4: The RII of ICT-mediated learning activities (1=Never to 5=Always)

S/N	ICT-mediated learning activity	Level of ICT usage					Total	RII	Rank
		1	2	3	4	5			
1.	Type and format notes and assignments using a Computer	9	41	83	96	142	371	0.776	2
2.	Design and make a PPT presentation	39	49	109	80	94	371	0.676	5
3.	Online discussion using the University LMS	86	71	98	59	56	370	0.561	8
4.	Online discussion of learning activities by using Social Networks	37	39	89	81	124	370	0.717	3
5.	Searching for online materials	7	17	61	81	205	371	0.848	1
6.	Online lectures by university instructors	352	15	4	0	0	371	0.212	9
7.	Open Online lectures and tutorials	76	54	108	58	75	371	0.601	7
8.	Online Tests through University LMS	67	56	112	78	58	371	0.602	6
9.	Online University examinations by using the University LMS	371	0	0	0	0	371	0.2	10
10.	Email communication with lecturers and students	36	50	107	75	102	370	0.685	4

Source: *Field data*

Pedagogical Support for Students' Digital Literacy Skills

The study also sought to confirm the existing pedagogies that support the development of necessary Digital Literacy Skills. The findings indicate that lecturers are more likely to encourage students to utilise ICT-based platforms and digital tools, assist them in identifying activities that require digital devices or platforms, and guide them on how to manage their online presence (Table 5). This support is intended to motivate students to utilise digital tools and platforms.

Table 5: Relative importance index of lecturers' support on Digital Literacy Skills

#	Form of Classroom Support	Not at all	Only in special cases	Only in a few subjects	In all subjects	In special subjects	Total	RII	Rank
1.	Encouraging them to use opportunities brought by ICTs and social networks in learning activities	1	1	8	17	14	41	0.805	1
2.	Identifying the type of activities to be done through face-to-face and others through online mode	6	2	13	13	7	41	0.663	3
3.	Guiding students on how to avoid plagiarism	3	9	13	15	1	41	0.610	6
4.	Guiding students to manage digital distraction	6	7	16	6	6	41	0.595	7
5.	Guiding them to manage their online footprint and be respectful in their online interactions and in meaningful information	4	6	15	8	8	41	0.649	4
6.	I embed tasks for critical thinking to enhance their use of e-information.	2	4	19	8	8	41	0.678	2
7.	Practices to promote digital literacy skills are also reflected in what the tests and examinations evaluate	7	9	12	8	8	44	0.649	4
8.	The course syllabus indicates learning activities and outcomes which reflect the development of DLSs	7	8	15	10	1	41	0.551	8
9.	The teaching activities create synergies between ICTs and subject-based learning activities to develop an interdisciplinary set of skills	1	7	19	13	1	41	0.629	5

10. Advising where to seek support in aspects such as installation, maintenance and repairs at the University.	2	9	12	12	5	40	0.629	5

Source: *Field data*

The findings suggest that lecturers are less likely to help students avoid plagiarism in writing assignments or manage digital distractions during learning. Further, lecturers rarely design teaching activities that create synergies between ICTs and learning activities. Additionally, lecturers do not provide students with guidance on basic skills regarding the installation, maintenance, and repair of ICT devices. To ascertain the strongest support that lecturers provide for students to develop Digital Literacy Skills, the study calculated the Relative Importance Index (RII), as indicated in Table 5.

The study finds that the majority of pedagogical support forms for students' Digital Literacy Skills in the checklist are irregular and inconsistent. The implementation of such pedagogical supports is not part of routine pedagogical operations. Indeed, the implementation of most of these supports is unplanned and therefore short-term:

> You just opened my eyes now; although I normally tell students on some of these matters, I have never thought this would have such an impact on students' learning with the technology. (Lecturer 7 interviewed on 16 July 2024).

DISCUSSION

The findings have shown that the majority of students perceive their digital literacy skills as above average, yet instructors hold a different opinion. This debate aligns with theoretical perspectives guiding this paper, such as the European Digital Competence Framework for Citizens (DigCompEdu). It is consistent with prior research on students' digital literacy and learning. Although lacking specificity, the review by Ndibalema (2025) similarly attributes difficulties in learning among university students in Tanzania and SSA to limited digital literacy skills. Consistently, Borokhovski et al. (2018) observed that students who cannot operate computers or similar devices are automatically challenged to learn in digital environments. Such limitations negatively affect the ways students learn with ICTs (Ay & Erdem, 2020). Digitally illiterate students are likely to commit plagiarism, fail to take active roles in collaborative tasks, write references and citations poorly, and subsequently cannot transfer learning (Nalaila et al., 2024). Ay and Erdem (2020) associate a lack of skills to evaluate electronic information with the dissemination of misinformation and misconceptions.

Additionally, the unprotected personal data and privacy of students make them prone to adverse non-academic use by hackers or commercial marketers (Krueger & Moore, 2015). This study highlights the urgent need to prioritise Digital Literacy Skills and implement dedicated initiatives to support students' engagement with responsive technologies (Handley, 2018). Such strategies are essential to facilitate learning within Vygotsky's Zone of Proximal Development (Rahmatirad, 2020; Wang et al., 2011).

The crosstabulation findings on students' perceived level of Digital Literacy Skills with years of study presented an insignificant improvement with a change in year of study. However, this contrasts with Lim et al. (2020), who noted that skills in using ICTs to manage personal data increased with progression in class. The current study noted gender parity in the majority of Digital Literacy Skills aspects, providing a unique perspective compared with Bhatt and MacKenzie (2019) and Samani et al. (2019), who observed gender differences favouring one gender in certain Digital Literacy Skills. The indifference between years of study and gender implies that students of different genders are exposed to similar technology-use environments.

This further suggests a narrowing of the gender gap in terms of digital literacy skills levels (Zhang et al., 2021). Later student cohorts reflect insignificant change in Digital Literacy Skills levels and are therefore likely to graduate with undesirable skill levels (Nalaila & Elia, 2024).

The study also examined how students use available ICTs for learning as a mechanism to develop Digital Literacy Skills. The study found both students' self-initiated and instructor-driven use of ICTs. Such engagement supports both operational and informational facets of Digital Literacy Skills. Students reported inconsistent engagement in key activities that promote Digital Literacy Skills, such as the use of emails, search engines, discussion forums through e-learning systems, and writing papers. The finding resonates with Bühler et al. (2021), who emphasise students' authentic use of ICTs and digital resources to promote appropriate Digital Literacy Skills. The findings contribute to debates where students perceive their digital literacy levels as well above average, yet their use of ICTs remains inconsistent (Sanfo, 2023; Almulla, 2022). Marín and Castañeda (2022) assert that the more students engage with digital technologies, the more they develop confidence and continue using ICTs.

This article demonstrates limited pedagogical practices aimed at promoting students' Digital Literacy Skills for learning at Mzumbe University. Instructors were surprised as to why students cannot use technology to the desirable standard. The findings demonstrate a consistent tendency for instructors not to feel accountable for students' unauthentic use of technology for learning (Ndibalema, 2025; Yu, 2022). The blurred consensus on who should support students' digital literacy —lecturers or other actors within the institution —suggests a lack of a clear institutional framework to support students' acquisition of Digital Literacy Skills (Nalaila & Elia, 2024). Rahayu and Sapriati (2018) note that inconsistent technology-use practices limit students' ability to engage in flipped learning and make them struggle to integrate technology with subject content. Borrowing from Yu (2022), students' learning activities created by their teachers are critical determinants of what ICTs students use and how they use them for learning (Wiegel, 2020). Nalaila et al. (2022) observed that limited classroom technology-use practices result in students' inability to create and use content ethically and to transfer learning. Consistent with this study, Reddy et al. (2022) argue that students encounter persistent challenges in learning with ICTs when their use is not integrated into classroom-designed activities. This underscores the imperative for educational systems to reevaluate existing pedagogical approaches and develop models that prioritise students' Digital Literacy Skills, aligning with Vygotsky's Sociocultural Learning Theory (Vuorikari et al., 2022; Zhang et al., 2021).

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the pedagogical approaches employed to foster students' acquisition of Digital Literacy Skills at Mzumbe University. Despite ongoing efforts to integrate ICT, these initiatives lack systematic and institutional coherence. A notable degree of laxity persists, allowing some instructors to opt out of using ICT, which limits students' opportunities to master essential digital competencies. Variations in instructors' engagement with ICT further contribute to disparities in the pace and extent to which students develop Digital Literacy Skills. Consequently, there is no assurance that graduates will possess the necessary digital competencies to remain competitive in lifelong learning within the context of the Fourth Industrial Revolution (4IR).

Practical and Policy Implications

These findings underscore the need for instructors to adopt a more proactive attitude, expand their pedagogical practices, and prioritise the development of students' Digital Literacy Skills. At the policy level, the findings highlight challenges such as poor infrastructure, curriculum overload, and inadequate facilities within existing frameworks. Specifically, the study recommends accelerating the University's digitisation efforts by improving infrastructure, providing relevant facilities, and building students' capacity by 2026, as mandated in Article 5 of the e-Government Act; prioritising capacity-building for instructors in ICT to support student-centered pedagogies, producing human resources that contribute to national development, as outlined in the Education and Training Policy of 2014, 2023 edition (p.45); and strategically scaling up the adoption of local digital learning platforms, as stipulated in Tanzania Vision 2050 (Section 5.5).

Limitations and Areas for future studies

The study's limitations include its scope and focus on investigating digital literacy skills among students as determinants of effective ICT infrastructure use at the University. Additionally, the inclusion of a single higher learning institution, with its specific student demographics, institutional culture, and resource availability, limits the generalizability of the findings to the broader population. Future studies may focus on administrative staff or alums, and on educational settings beyond HLIs, as these populations may exhibit different perspectives, experiences, or behaviours relevant to the study's topic.

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Authors' Contributions

Jimmy E. Kihwele served as the Principal Investigator, leading the proposal development, fieldwork, overseeing data analysis, and guiding report writing, which culminated in the development of the manuscript. Stephano Nalaila served as the Co-Principal Investigator, working alongside the Principal Investigator in proposal development, coordinating the fieldwork, report writing, and manuscript preparation

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