

INTEGRATING ICT TOOLS IN LESSON PREPARATION AND DELIVERY: A WAY TO GO IN ZAMBIAN SCHOOLS

Natalia Zulu¹

Zambia University College of Technology: zulunatalia03@gmail.com

Betty Shitima Bweupe¹

Zambia University College of Technology: bbweupe@zut.edu.zm

Gift Masaiti¹

University of Zambia: gift.masaiti@unza.zm

Kasonde Mundende¹

Nkwame Nkrumah University: kmundende@gmail.com

Ireen Bwembya²

Ministry of Education: Bwembyaireen@gmail.com

David Sinyangwe²

Zambia University College of Technology: dsinyangwe@zut.edu.zm

Corresponding author: zulunatalia03@gmail.com

Abstract

This study, conducted in Ndola, Zambia, investigated the integration of Information and Communication Technologies tools in primary and secondary school lesson preparation and delivery. Underpinned by a pragmatic research paradigm and guided by Connectivism Learning Theory and Technology Acceptance Model, researchers employed a mixed-methods approach precisely exploratory sequential design, utilizing surveys and interviews with 322 participants. For data collection, systematic random sampling and purposive sampling techniques were employed. Findings highlighted significant barriers to effective ICT integration, including limited resources, inadequate teacher training, and a lack of robust ICT policies. To address these challenges, the study recommends strengthening of ICT infrastructure, and prioritizing retraining of teachers in modern technologies. Encouraging the use of phones and tablets by both teachers and student and fostering strong partnerships with government agencies and private sector entities is also essential for sustained support. These efforts are crucial to leverage the potential of ICTs to enhance learning outcomes.

Keywords: Lesson preparation, Lesson delivery, ICT Integration, Education.

1.0 Introduction

The integration of Information and Communication Technology (ICT) in education has become essential for enhancing lesson preparation and delivery, especially in government schools. It assesses the current utilization of ICT tools in Zambian schools, establish effective strategies for their integration, and examines their impact on lesson planning and delivery across primary and secondary education. Lesson planning, in this context, refers to the structured approach teachers use to organize instructional content and activities to meet learning objectives, while lesson delivery involves the methods and processes employed to implement these plans effectively. The study is organized into four sections: an overview of the study's background and context, the theoretical framework guiding the research, the methodology employed, and an analysis of the findings, culminating in a discussion of conclusions and recommendations.

2.0 Background and context of the study

The integration of Information and Communication Technologies (ICT) into education has significantly transformed traditional teaching and learning practices. Recent research by Chembe, Nasilele, and Msendo (2023) suggests that technology can significantly impact the education sector. By leveraging ICT tools, educators can create dynamic and engaging learning environments that cater to diverse learner needs (Anastasopoulou et al., 2024).

A growing body of research has highlighted the transformative potential of ICTs in education. Studies have shown that the use of ICT tools can enhance student learning by providing diverse learning experiences, promoting critical thinking, and fostering collaboration (Ghavifekr et al., 2024; Chembe et al. 2023; Ghavifekr & Rosdy, 2015; Makgati & Awolusi, 2020). Additionally, ICT has revolutionized access to information, enabling self-directed learning and supporting diverse learning styles. This has made education more accessible, personalized, and engaging (Anastasopoulou et al., 2024).

Furthermore, ICTs have expanded learning opportunities beyond the traditional classroom setting. The use of the internet has encouraged self-directed learning and nurtured a lifelong quest for knowledge. Technology also plays a crucial role in developing essential 21st-century skills, such as digital literacy, which equips learners with the ability to assess and navigate online information effectively (Kalyani, 2024).

In recent years, there has been a surge in the adoption of innovative learning technologies, including e-learning, online learning, blended learning, and mobile learning (Ghasia & Musabila, 2018). These technologies offer numerous benefits, including flexibility, accessibility, and personalized learning experiences, hence the need of a paradigm shift in the education system to maximize the benefits brought about by technological advancement and changing skills (Mumba 2023). However, to maximize their potential, it is essential to consider factors such as teacher training, infrastructure, and curriculum development (Johnson et al., 2016; Kalyani, 2024). Researchers like Awouters and Jans (2009) have emphasized the importance of teacher competencies in ICT integration, including awareness, readiness, and pedagogical-didactical skills.

Several studies have explored the integration of ICTs in Zambian education. A common theme emerging from these studies is the positive perception of ICTs among teachers and learners. Kalimaposo, Moono, Daka, and Mulubale (2023) found that both teachers and pupils had positive perceptions towards ICT as an examinable curriculum subject. Similarly, Mulima and Simuchimba (2022) and Mweene and Banda (2023) revealed that teachers perceived ICTs as valuable pedagogical tools that enhanced learner engagement and understanding. Mweene and Banda (2023), also emphasized the potential of ICT to tailor instruction to individual needs. Additionally, Chisunka-Mwila, Lamba-Daka, Mulauzi, and Njobvu (2011), found that students who used ICT-based learning materials were more engaged and motivated to learn.

However, these studies also highlighted several challenges hindering the effective integration of ICTs in Zambian schools. A recurring theme is the lack of adequate infrastructure, including unreliable power supply and limited access to internet connectivity. For instance, Kaumba, Mphahlele, Muleya, and Simui (2021) identified poor internet connectivity and inadequate ICT equipment as major barriers in rural primary schools. Nsama, Mkandawire, Lisulo, and Hamweete (2021) also emphasized the impact of load-shedding and inadequate infrastructure on ICT integration in secondary schools.

Another significant challenge identified in these studies is the lack of teacher training and capacity building (Mumba 2018). Banda (2016) and Nyanja (2019) highlighted the need for increased teacher training to improve their ICT skills and knowledge. Chileshe (2019) also emphasized the importance of teacher training in effectively integrating ICTs into the teaching and learning process.

Despite these challenges, the potential benefits of ICT integration are evident. Chileshe (2019) demonstrated the positive impact of ICTs on student performance in genetics. By providing access to a variety of resources and interactive learning tools, ICTs can enhance student engagement and motivation.

To address these challenges and maximize the benefits of ICT integration, the ANTSIT report (n.d.) provided several recommendations, including investments in infrastructure, teacher training, and resource sharing.

While these studies have provided valuable insights into the integration of ICTs in Zambian education, further research is needed to specifically investigate the current state of ICT integration in lesson preparation and delivery. This study aims to address this gap by exploring the challenges and opportunities, and proposing strategies to optimize the use of ICT tools to enhance teaching and learning.

3.0 Theoretical underpinning: Connectivism Learning theory and Technology Acceptance Model (TAM)

This paper was guided by two theories thus; Connectivism Learning theory and Technology Acceptance Model (TAM). Connectivism, a 21st-century learning theory, aligns well with the demands of modern education. It emphasizes the importance of networking, collaboration, and the continuous acquisition of knowledge (Siemens, 2004). This theory posits that learning is a dynamic process facilitated by technology and social connections (Bessenyei, 2007). Connectivism provides a framework for understanding how learning occurs in the digital age, emphasizing the importance of building and navigating networks of connections (Siemens, 2005)

A key aspect of Connectivism is the role of technology in fostering learning. Digital tools can facilitate communication, collaboration, and access to information. By using technology effectively, educators can create a more interactive and personalized learning environment. Additionally, connectivism emphasizes the importance of self-directed learning. By providing students with opportunities to explore their interests and set their own learning goals, educators can empower them to become active learners (Siemens, 2004).

Connectivism learning theory, offers a promising framework for transforming education in Zambia. By emphasizing the importance of networking, collaboration, and the continuous acquisition of knowledge, this theory aligns well with the evolving needs of Zambian learners. This can be achieved by applying the principles of connectivism (Siemens, 2004), which can foster digital literacy, promote collaborative learning, personalize learning, and develop lifelong learners among Zambian learners.

Coming to Technology Acceptance Model (TAM), this model serves as a valuable framework for understanding the factors that influence the acceptance of technology in teaching and learning environments. TAM, an information systems theory, posits that user acceptance of technology is primarily driven by two key perceptions: perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness refers to the extent to which individuals believe that using a particular technology will enhance their performance or assist them in achieving their educational goals. Conversely, perceived ease of use pertains to the degree to which individuals believe that using the technology will be effortless and straightforward. According to Davis, Bagozzi, and Warshaw (1989), these perceptions directly influence an individual's intention to use the technology, which subsequently predicts their actual usage behavior. In Zambia there are a number of factors that

predicts the usage behavior of ICT tools. These include; digital divide, teacher training, infrastructure and cultural factors.

However, by combining these two theoretical frameworks, this study can gain a deeper understanding of how to effectively integrate ICT tools in lesson preparation and delivery. It can explore how to create learning environments that align with the principles of Connectivism, while simultaneously addressing the factors that influence teacher adoption of technology as outlined by TAM. This integrated approach can provide valuable insights for educators, policymakers, and researchers in Zambia on how to maximize the potential of ICT to enhance teaching and learning.

4.0 Research Problem and Research Objectives

Vision 2030 aspires to transform Zambia into a prosperous and industrialized nation. A key pillar of this vision is the development of a knowledge-based economy, which requires a highly skilled workforce and the effective use of technology (Republic of Zambia, Vision 2030).

Despite the increasing availability of Information and Communication Technologies (ICT) tools, their integration into lesson preparation and delivery in Zambian schools remains limited (Ministry of Education, 2023; UNICEF, 2022; Mumba, 2018). This is evident in the persistent use of traditional teaching methods, which often fail to engage learners and hinder effective learning outcomes. This is because of limited access to technology (Ministry of Education, 2023), inadequate teacher training (Mumba, 2018), poor curriculum integration (Zambia Institute of Advanced Technology, 2022), varying student digital literacy (UNICEF, 2022), and frequent technical issues (Ministry of Education, 2021).

However, despite numerous studies on the integration of ICT tools in lesson preparation and delivery in Zambia (Mphahlele, Muleya, & Simui, 2020; Nsama, Mkandawire, Lisulo, & Hamweete, 2021; Chileshe, 2019; Nyanja, 2019; Mumba, 2018; Banda, 2016), the integration of ICT tools in lesson preparation and delivery remains a significant challenge. This poses a significant obstacle to achieving the goals outlined in Zambia's Vision 2030.

Therefore, this paper sought to address the following research objectives:

- i) To assess the current usage of ICT tools in government schools in Ndola district of Zambia
- ii) To establish effective integration methods of ICT tools by teachers in lesson preparation and delivery in the above mentioned schools,
- iii) To examine the impact of integrating ICT tools in lesson preparation and delivery in both in the same schools

5.0 Methodology

This paper employed a mixed-methods approach, specifically utilizing exploratory sequential design and guided by a pragmatic philosophical underpinning. The quantitative component involved a survey questionnaire administered to a sample of 302 teachers (both primary and secondary school teachers) in Ndola District, Copperbelt Province, Zambia. The qualitative component involved semi-structured interviews with a purposive sample of 10 teachers and 10 learners from

the same district. The quantitative data were analyzed using descriptive statistics, while the qualitative data were analyzed thematically.

To ensure the validity and reliability of the research, content validity was established through literature review and expert consultation. Additionally, ethical considerations, such as obtaining informed consent from participants and securing permission from authorities, were adhered to.

The following sections will present the findings and discussion of this research paper.

6.0 Findings and Discussion

This study aimed to investigate three key areas: the current usage of ICT tools in lesson preparation and delivery in government schools; effective integration methods of ICT tools by teachers in lesson preparation and delivery; and the impact of integrating ICT tools in lesson preparation and delivery in the same schools. To address these objectives, descriptive statistics, and thematic analysis were employed. The following findings emerged:

6.1 Demographic information

The sample consisted of 280 respondents, predominantly female (55%). Most participants were subject teachers (80%), with a significant number holding positions as heads of departments (10%) and head teachers (10%). In terms of education, the majority possessed a Bachelor's degree (65%), followed by a Diploma (30%) and a Master's degree (5%). The sample was primarily urban-based (90%), with a smaller proportion from peri-urban areas (10%). The age distribution was diverse, with a notable concentration in the 40-49 age group (35%), followed by the 20-29 and 30-39 age groups (30% and 25%, respectively). A smaller number of respondents were in the 50-59 age group (10%).

6.2 Qualitative results

By conducting qualitative research, we gained a deeper understanding of the factors that influence the successful integration of ICT tools in Zambian schools, as evidenced in the results below.

Objective 1: Current usage of ICT tools in lesson preparation and delivery

Interview data revealed that the integration of ICT in government schools faces numerous challenges, including a lack of comprehensive ICT policies and inadequate infrastructure. Teachers often lack the necessary ICT knowledge and skills, and may hold negative attitudes towards its integration. Insufficient teacher training and professional development further hinder its adoption. Additionally, high costs associated with ICT equipment and maintenance, unreliable power supply, and ineffective internet connectivity pose significant obstacles. Psychological barriers such as fear of technology, time constraints, and lack of motivation also contribute to these challenges. This is illustrated by the following verbatim quote:

Teachers A stated,

"It's really tough. We do not have good internet, the computers are slow, and many of us do not know how to use them properly. Plus, there's no real support or training."

Teacher C also echoed this sentiment, stating *I am afraid of technology; it is too complicated for me*. Teacher B added by saying that, *Computers are too expensive, we cannot afford them*.

From these qualitative results, the following themes emerged **policy and infrastructure, teacher capacity, resource constraints and psychological barriers**.

Emerg ed Policy and Infrastructure: Effective ICT integration necessitates robust government policies and well-developed infrastructure (Ministry of Education, Zambia, 2020). A comprehensive national ICT in education policy is crucial to guide the integration process, setting clear goals, allocating resources, and establishing accountability mechanisms. Furthermore, reliable and equitable access to technology and infrastructure is paramount. This includes high-speed internet connectivity in all schools, sufficient and up-to-date computers and other ICT devices, reliable electricity supply, and adequate technical support and maintenance services.

Teacher Capacity: Equipping teachers with the necessary digital literacy, pedagogical skills, and confidence is crucial for successful ICT integration (Mumba & Banda, 2018). Comprehensive and ongoing professional development programs are essential to enhance teachers' abilities to effectively utilize ICT tools, design engaging learning activities, and assess student learning in the digital age. Addressing teacher anxieties and concerns about using technology in the classroom is also crucial. This may involve providing support and mentorship, fostering a collaborative learning environment among teachers, and showcasing successful examples of ICT integration.

Resource Constraints: Resource constraints significantly hinder the effective integration of ICT in education. Limited budgets can restrict the procurement of necessary equipment, software, and internet connectivity (Ministry of Education, Zambia, 2020). Accessibility constraints, particularly in rural areas, can limit access to technology and internet connectivity (Mumba & Banda, 2018). Furthermore, unequal access to resources can exacerbate existing inequalities in education, creating a digital divide between schools and students.

Psychological Barriers: These barriers can hinder the effective integration of ICT in education. Concerns about the complexity of technology, fear of failure, and lack of confidence can hinder teacher adoption of ICT (Cuban, 2001). Teachers may resist change and prefer familiar teaching methods, even if they are less effective. Addressing these psychological barriers requires creating a supportive environment that encourages experimentation, provides ongoing support, and celebrates successful ICT integration initiatives.

However, it is vital to note that the integration of Information and Communication Technologies (ICTs) in Zambian schools presents a complex landscape, characterized by a myriad of challenges that affects its usage. Addressing these challenges requires a multi-faceted approach, including policy reforms, infrastructure development, teacher training, and sustained funding. By overcoming these obstacles, Zambia can harness the power of ICT to improve the quality of education and empower its students and teachers.

Objective 2: Effective integration methods of ICT tools by teachers in lesson preparation and delivery

The interviews revealed several key areas of ICT integration in the classroom. Students and teachers alike highlighted the increasing reliance on personal devices like smartphones and tablets. As Student H had put it,

"My phone is my constant companion. I use it for everything from researching to submitting assignments."

Teacher D also emphasized the importance of online resources and collaborative learning tools and he stated that,

Platforms like Google Classroom have revolutionized how we interact with students. We can share resources, assign tasks, and provide feedback seamlessly."

In support to this sentiment Teacher B highlighted the benefits of online discussion forums by saying:

"These forums foster critical thinking and encourage students to engage with each other's ideas. It's a great way to promote active learning."

However, the interviews also revealed a need for more comprehensive teacher training and professional development.

One interviewee by the name of Teacher E expressed frustration, saying,

"While I'm enthusiastic about using technology, I often feel overwhelmed. We need more training on specific tools and strategies to effectively integrate them into our lessons."

Analysis of the results revealed four key themes influencing the methods used to integrate ICT tools in education: **technological integration, pedagogical approaches, teacher capacity, and infrastructure and resources**. These themes are in line with Mumba and Banda, (2018)'s study.

Technological Integration: Technological Integration: Here, success hinges on selecting appropriate technologies that align with learning objectives and cater to diverse learning styles (Cuban, 2001). This includes utilizing interactive whiteboards for collaborative brainstorming, employing educational software for simulations and data analysis, and incorporating online resources for research and independent learning.

Pedagogical Approaches: it is imperative to know that shifting from teacher-centered to student-centered approaches, such as inquiry-based learning and collaborative projects, is crucial (Cuban, 2001). ICT tools facilitate these approaches by enabling interactive learning experiences, fostering critical thinking, and promoting learner autonomy (Mweene, & Banda, 2023). Moreover, ICT can bridge the digital divide, providing equal access to quality education, regardless of geographical location

Teacher Capacity: This is one of the factors that significantly influences the method of ICT integration employed by teachers in lesson preparation and delivery (Mumba & Banda, 2018). Equipping teachers with the necessary digital literacy, pedagogical skills, and confidence is paramount (Mumba & Banda, 2018). This involves comprehensive training programs, ongoing professional development opportunities, and access to relevant resources and support networks.

Infrastructure and Resources: A robust and equitable ICT infrastructure is essential, including reliable internet connectivity, sufficient and functional ICT equipment, and adequate technical support. Addressing challenges such as power outages and ensuring regular maintenance of equipment is crucial (Ministry of Education, Zambia, 2020) in choosing effective strategies of integrating ICT tools in lesson preparation and delivery.

By addressing these themes (technological integration, pedagogical approaches, teacher capacity, and infrastructure and resources) within the specific context of Zambia, educators and policymakers can effectively leverage the potential of ICT to enhance the quality of education and improve learning outcomes for all learners.

Objective 3: Impact of ICT integration in lesson preparation and delivery

Interview data revealed several potential benefits of ICT integration in education. Participants highlighted improved student performance, increased engagement, and the development of critical thinking and problem-solving skills. The flexibility of ICT allows for personalized learning and self-paced instruction, empowering students to learn at their own pace. Additionally, ICT provides access to a wealth of learning resources, fostering knowledge-based communities and peer-to-peer learning. Teachers also noted the potential for reduced workload through automation and the use of online tools. This is supported by the following verbatim

Teacher D remarked,

"ICT has really transformed my classroom. Students are more engaged, and I'm able to differentiate instruction to meet their individual needs."

Student B also expressed enthusiasm for the personalized learning opportunities afforded by ICT by saying:

"I love being able to learn at my own pace. If I do not understand something, I can pause the video or replay it until I get it. It's really empowering."

Teacher C also highlighted the potential of ICT to foster collaboration and critical thinking. In supporting this sentiment, he said that:

"Online discussion forums have been a game-changer. Students are actively engaging with each other, sharing ideas, and challenging each other's thinking. It's amazing to see the level of critical thinking they're developing."

Teacher E also emphasized the importance of teacher training when she said that:

"While ICT offers great potential, it's crucial that teachers are equipped with the necessary skills to use these tools effectively. We need ongoing professional development to stay up-to-date with the latest technologies and pedagogical approaches."

From these results, the following themes emerged: **enhanced learning outcomes, expanded access to knowledge and resources, improved teaching and learning practices and fostering collaboration.**

Enhanced Learning Outcomes: In the Zambian context, ICT integration has the potential to significantly improve student performance by addressing some of the challenges faced in traditional education. Studies have shown that the use of ICT can enhance student engagement and motivation, leading to improved academic achievement (Mumba & Banda, 2018). For example, the use of interactive educational software and online resources can make learning more engaging and interactive, particularly for subjects like mathematics and science. These tools can foster a more engaging and interactive learning environment, leading to improved student performance, critical thinking skills, and problem-solving abilities. Additionally, ICT can facilitate personalized learning, allowing learners to learn at their own pace and access educational materials anytime, anywhere. This aligns with the findings of various researchers, including Mweene and Banda (2023), who emphasize the potential of ICT to tailor instruction to individual needs and Chisunka-Mwila, et al (2011) who highlighted the role of ICT in providing flexible learning opportunities and promoting self-paced learning.

Expanded Access to Knowledge and Resources: Given the limited access to quality educational resources in some parts of Zambia, ICT integration can significantly expand students' access to knowledge (Mumba & Banda, 2018). Online platforms provide access to a wealth of information, including digital libraries, educational websites, and online courses. This can be particularly beneficial for students in remote areas with limited access to physical libraries and educational resources. Moreover, ICT can bridge the digital divide, providing equal access to quality education, regardless of geographical location (Ministry of Education, Zambia, 2020).

Improved Teaching and Learning Practices: ICT integration can facilitate a shift from traditional teacher-centered approaches to more learner-centered methodologies, such as inquiry-based learning and collaborative projects (Mumba & Banda, 2018). Teachers can utilize online platforms and tools to create interactive learning experiences, foster critical thinking, and encourage learner-centered learning. For teachers, ICT can also streamline administrative tasks, enhance lesson planning and delivery, and provide opportunities for professional development. Above all the utilization of ICT tools reduces teacher workload.

Fostering Collaboration: ICT can facilitate collaborative learning environments by enabling students to connect with peers and experts from around the world. Online platforms and communication tools can be used for group projects, online discussions, and peer-to-peer learning. This can enhance communication skills and foster a deeper understanding of complex topics. By embracing these technological advancements, Zambia can empower its learners and teachers, paving the way for a brighter future.

While the qualitative data provided deeper underlying experiences and perceptions of teachers and students, quantitative data provided valuable insights into the perceived impact of ICT integration as presented below;

Quantitative findings

Objective 1: Current ICT usage in government schools (both primary and secondary schools)

Table 1: Current ICT usage in government schools (both primary and secondary schools)

Factor	Mean	Standard Deviation	Frequency (N)
<i>Lack of effective ICT policy</i>	3.57	1.30	280
<i>Lack of Knowledge in ICTs</i>	3.75	1.16	280
<i>High cost of ICT facilities and equipment</i>	3.93	1.14	280
<i>Epileptic power supply</i>	3.75	1.16	280
<i>Teacher reluctance to use ICTs</i>	3.36	1.23	280

Source: Research Data 2024

The analysis of the data in table 2 reveals significant challenges hindering the effective integration and the current usage of ICTs in Zambian schools particularly in Ndola district.. These challenges align with the principles of Connectivism Learning Theory, which emphasizes the importance of networks, connections, and the ability to navigate and utilize information.

The mean scores for the factors "Lack of effective ICT policy" (M = 3.57, SD = 1.30), "Lack of knowledge in ICTs" (M = 3.75, SD = 1.16), "High cost of ICT facilities and equipment" (M = 3.93, SD = 1.14), "Epileptic power supply" (M = 3.75, SD = 1.16), and "Teachers' reluctance to use ICTs" (M = 3.36, SD = 1.23) indicate a moderate to strong agreement with these challenges. These findings suggest that the current state of ICT integration in lesson preparation and delivery in Zambian schools precisely Ndola district is hindered by a variety of factors, including limited access to technology, inadequate teacher training, and unreliable infrastructure. This is supported by Mumba (2018) and Nsama et al (2021)' studies.

To foster a more connected learning environment, it is crucial to address these challenges by equipping teachers with the necessary ICT skills and knowledge to effectively integrate technology into their teaching practices and ensuring access to reliable internet connectivity and modern ICT equipment to facilitate seamless online learning. Creating Supportive Learning Environments can also foster a culture of innovation and collaboration, where learners are encouraged to explore, experiment, and connect with others.

By addressing these challenges and embracing the principles of Connectivism (Siemens, 2005) while considering the factors that influence technology adoption as outlined by the Technology Acceptance Model (TAM) (Davis, 1989), Zambian schools can create a more dynamic, flexible, and learner-centered learning environment that prepares students for the challenges and opportunities of the 21st century.

Objective 2: ICT Integration Methods

Table 2: Descriptive Statistics of ICT Integration Methods

Strategy	Mean	Standard Deviation	Frequency (N)
<i>Online Discussion</i>	<i>11.67</i>	<i>7.18</i>	<i>280</i>
<i>Google Classroom</i>	<i>13.33</i>	<i>5.77</i>	<i>280</i>
<i>Laptops/Phones/Tablets</i>	<i>105.17</i>	<i>61.65</i>	<i>280</i>
<i>Educational Software</i>	<i>100.00</i>	<i>38.10</i>	<i>280</i>
<i>Online Resources</i>	<i>80.00</i>	<i>53.85</i>	<i>280</i>

Source: Research data 2024

The descriptive statistics indicate that respondents generally had a positive view of integrating ICTs in lesson preparation and delivery. Laptops, phones, and tablets received the highest mean score ($M = 105.17$, $SD = 61.65$), suggesting strong support for their use, aligning with contemporary research emphasizing the potential of technology to transform teaching and learning. This is in agreement with Chembe, Nasilele, and Msendo (2023) who argued that "the integration of AI in education has the potential to revolutionize the learning process" (p. 32). This can only be made possible through the integration of ICT tools in lesson preparation and delivery.

Educational software ($M = 100.00$, $SD = 38.10$) and mobile devices ($M = 97.50$, $SD = 49.04$) also received high ratings, supporting the notion that these tools can enhance student engagement, motivation, and learning outcomes as illustrated by connectivism learning theory (Siemens, 2004).

Online resources ($M = 80.00$, $SD = 53.85$) and Google Classroom ($M = 13.33$, $SD = 5.77$) received moderate to neutral ratings, suggesting that while these tools have potential to enhance learning by connecting learners with diverse information and fostering collaboration (Connectivism), their effective use may depend on factors such as teacher training, technical support, and curriculum integration. These factors align with TAM, as ease of use and perceived usefulness are crucial for technology adoption.

Online discussions had the lowest mean score ($M = 11.67$, $SD = 7.18$), indicating less agreement on their effectiveness. This finding may be related to challenges in facilitating meaningful online discussions, as noted by Garrison, Anderson, and Archer (2000). While Connectivism emphasizes the importance of networked interactions, effective online discussions require careful planning and facilitation to ensure they are engaging, meaningful, and contribute to learning outcomes. This aligns with TAM, as perceived ease of use for both teachers and students in navigating and participating in online discussions is critical for their successful implementation

However, to maximize the benefits of ICT integration in Zambia, it is crucial to address the following:

- (i) *Infrastructure*: Ensuring reliable internet connectivity and adequate technological infrastructure in schools is essential.
- (ii) *Teacher Training*: Providing comprehensive training to teachers on how to effectively use ICT tools in their classrooms is crucial.
- (iii) *Digital Literacy*: Promoting digital literacy among both teachers and students is essential for successful ICT integration.
- (iv) *Curriculum Integration*: Aligning the use of ICTs with the national curriculum and learning objectives is crucial.
- (v) *Accessibility*: Ensuring equitable access to technology for all students, regardless of their socioeconomic background, is important.

By addressing these challenges and leveraging the potential of ICTs, Zambia can improve the quality of education and prepare its students for the 21st century.

Objective 3: Impact of Integrating ICT tools in Lesson Preparation and Delivery

Table 3: impact of integrating ICT tools in lesson preparation and delivery

Factors	Mean	Standard Deviation	Frequency (N)
<i>Learner performance improvement</i>	3.93	1.09	280
<i>Flexible learning</i>	4.29	0.87	280
<i>Engaged learning</i>	3.751	.09	280
<i>Knowledge-based communities</i>	3.68	1.15	280
<i>Reduced teacher workload</i>	4.29	0.69	280
<i>Access to diverse teaching materials</i>	4.46	0.64	280

Source: Research Data 2024

The analysis of the data reveals several significant impacts of integrating ICT tools in lesson preparation and delivery. These findings align with the principles of Connectivism Learning Theory (Siemens, 2004), which emphasizes the importance of networks, connections, and the ability to navigate and utilize information effectively. As Siemens (2004) argues, "Learning and knowledge rests in diversity of opinions and the ability to discern the validity in those opinions" (p. 6). By providing access to a variety of information sources, ICT tools can help learners develop critical thinking and problem-solving skills, key aspects of navigating and utilizing information within a connected learning environment.

Furthermore, these findings resonate with the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use are key determinants of technology adoption (Davis,

1989). The high mean scores for "Flexible learning" ($M = 4.29$, $SD = 0.87$) and "Access to diverse teaching materials" ($M = 4.46$, $SD = 0.64$) suggest that ICT tools enhance learning flexibility and resource access, aligning with the perceived usefulness aspect of TAM. This is particularly relevant in the Zambian context, where geographical barriers and resource constraints can limit access to quality education. By leveraging ICT tools, learners can access educational resources and engage in learning activities at their own pace and convenience, thus increasing the perceived usefulness of these technologies.

The moderate mean scores for "Engaged learning" ($M = 3.75$, $SD = 1.09$) and "Knowledge-based communities" ($M = 3.68$, $SD = 1.15$) indicate that ICT tools can foster active learning and collaborative communities, consistent with both Connectivist principles and the ease of use aspect of TAM. When teachers and students perceive ICT tools as easy to use for communication, collaboration, and knowledge sharing, they are more likely to adopt and effectively utilize these technologies for engaged learning experiences.

The high mean score for "Reduced teacher workload" ($M = 4.29$, $SD = 0.69$) suggests that ICT tools can streamline teaching processes, which can significantly impact perceived ease of use for educators. Finally, the moderate mean score for "Learner performance improvement" ($M = 3.93$, $SD = 1.09$) indicates potential for enhanced student outcomes, further supporting the overall usefulness and effectiveness of ICT integration in education.

However, to maximize the benefits of ICT integration, it is essential to address challenges such as inadequate infrastructure, teacher training, and digital literacy. By doing so, Zambian schools can create more dynamic, flexible, and learner-centered learning environments. However, further research is needed to fully understand the impact of ICT integration.

7.0 Conclusion

This study underscores the potential of integrating Information and Communication Technologies (ICT) tools in Zambian government schools to significantly enhance the quality of education. By analyzing the current state of ICT usage and identifying key barriers, such as a lack of ICT policy, inadequate teacher training, and unreliable power supply, this research provides actionable recommendations for maximizing the benefits of ICT integration.

Encouraging collaborative online discussions, leveraging centralized platforms like Google Classroom, and promoting the use of diverse devices, including laptops, phones, and tablets, can revolutionize teaching and learning. The integration of interactive educational software and mobile applications empowers students to become active learners, fostering knowledge-based communities and reducing teacher workload.

By fully embracing ICT integration, Zambian schools can improve learner performance, provide flexible learning opportunities, and create engaging and interactive classrooms. This study serves as a catalyst for educational transformation, urging policymakers, educators, and stakeholders to prioritize ICT initiatives and invest in the future of Zambian education.

8.0 Implications for Policy and Practice

The findings of this study have significant implications for policymakers, educators, and other stakeholders in the Zambian education sector. Given that most of the recommendations in the 2020 ICT policy for education in Zambia have not been fully achieved, here are some key recommendations:

Policy Recommendations

- **Invest in ICT Infrastructure:** Significant investments are needed to improve internet connectivity, power supply, and digital infrastructure in schools. This will ensure that teachers and learners have reliable access to ICT tools
- **Allocate Adequate Funding:** Sufficient funding should be allocated to support ICT initiatives, including teacher training in the usage of modern technologies and pedagogies such as blended learning, software licensing, and hardware maintenance.
- **Establish Strong Monitoring and Evaluation:** To ensure effective ICT integration, it is crucial to conduct regular assessments to track progress, gather data on teacher and student ICT usage, and utilize this data to inform policy adjustments. This continuous monitoring and evaluation process will help identify challenges, measure the impact on student learning outcomes, and ensure that ICT integration strategies are effective and sustainable.
- **Foster Public-Private Partnerships:** To foster a sustainable ICT ecosystem, collaboration is key. The government should actively partner with technology companies to provide affordable access to devices, software, and internet services. Furthermore, engaging with civil society organizations, such as NGOs, will strengthen ICT integration efforts through shared expertise in areas like teacher training, resource development, and advocacy for increased government investment. This concisely captures the essence of collaboration with technology companies and civil society organizations in the context of ICT integration.
- **Develop and Localize Content:** To enrich the learning experience, it's crucial to develop high-quality, locally relevant educational resources. This includes creating digital learning materials such as videos, simulations, and interactive exercises that are aligned with the Zambian curriculum and culturally appropriate. Furthermore, promoting the creation and sharing of locally developed Open Educational Resources (OER) will enhance access and affordability of these valuable learning materials.

Pedagogical Recommendations

- **Student-Centered Learning:** Teachers should adopt learner-centered approaches that utilize ICT tools to promote active learning, critical thinking, and problem-solving skills, which is key in inculcating 21st century skills.
- **Digital Literacy:** Both teachers and learners should be provided with opportunities to develop digital literacy skills, enabling them to effectively use ICT tools for learning and communication.
- **Collaborative Learning:** ICT tools can facilitate collaborative learning experiences, enabling students to work together on projects and share knowledge. Teachers and learners should be encouraged to use ICT tools in collaborative learning

- **Teacher Professional Development:** Continuous professional development programs should be designed to equip teachers with the necessary pedagogical skills to effectively integrate ICT into their teaching practices, precisely the use of blended learning in lesson delivery.
- **Incentivize teacher participation:** Offer incentives and rewards to encourage teacher participation and successful integration of ICT in their classrooms.

By implementing these recommendations, Zambian schools can harness the power of ICT to improve teaching and learning outcomes, prepare students for the digital age, and bridge the digital divide.

Acknowledgements

We extend our sincere gratitude to all teachers and school administrators who participated in this study. We also thank the Permanent Secretary Copperbelt Province, Mr. Augustine Kasongo, for granting permission to conduct this research. Without their invaluable contributions, this study would not have been possible.

References

- Alam M. A, (2023). Connectivism Learning Theory and Connectivist Approach in Teaching and Learning: A Review of Literature. *Bhartiyam International Journal of Education and Research* 12 (2) 2277-1255
- Anastasopoulou, E., Tsagri, A., Avramidi, E., & Lourida, K. (2024). The Impact of ICT on Education. *Technium Social Sciences Journal*, 58, 48-55.
- ANTSIT. (n.d.). *Appropriate New Technologies to Support Interactive Teaching in Zambian schools (ANTSIT)*. Funded by the UK government's Department for International Development (DFID).
- Awouters, P., & Jans, W. (2009). ICT competence of teachers: A conceptual framework. *Computers & Education*, 52(3), 431-442.
- Banda, I. (2016). *The Implementation of Information Communication Technology in the Primary Education Curriculum in Selected Schools of Chipata District, Zambia*. Lusaka: University of Zambia.
- Bessenyei, G. (2007). Connectivism: A New Paradigm of Learning. *International Journal of Instructional Technology and Distance Learning*, 4(3), 3
- Chembe, C., Nasilele, N. B., & Msendo, R. (2023). The Fuss about Artificial Intelligence in Education Sector: Should we Worry?. *Zambia Information Communication Technology (ICT) Journal*, 7(2), 30-35.

- Chileshe, G. (2019). *Integration of ICT in the Teaching and Learning of Genetics in Selected Secondary Schools in Kitwe District, Zambia*. University of Zambia, School of Education.
- Chisunka-Mwila, M., Lamba-Daka, E., Mulauzi, M., & Njobvu, M. (2011). The integration of ICTs in Zambian education: A case study. *Journal of Educational Computing Research*, 45(3), 307-323.
- Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Harvard University Press.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.
- Enala, S. L. (2015). *Primary School Teachers' Attitudes towards ICT integration in Social Studies: A Study of Lusaka and Katete Districts*. University of Zambia.
- Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2-3), 87-105.
- Ghasia, E., & Musabila, C. (2018). The impact of mobile learning on students' academic performance in higher education institutions in Tanzania. *International Journal of Educational Technology in Higher Education*, 15(1), 1-16.
- Ghavifekr, S., Abd Razak, A. Z., Ghani, M. F. A., Ran, N. Y., Meixi, Y., & Tengyue, Z. (2024). ICT Integration In Education: Incorporation for Teaching & Learning Improvement. *The Malaysian Online Journal of Educational Technology*, 2(2).
- Ghavifekr, S. & Rosdy, W.A.W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES)*, 1(2), 175-191.
- Jebba, M. A., & Umaru, N. N. (n.d.). A Review of Connectivism Theory as a Benchmark for 21st Century Teachers and Students. *Journal of Technical Education and Vocational Training*. Retrieved from <https://jotvetar.org/volume2/paper16.pdf>
- Johnson, A. M., Jacovina, M. E., Russell, D. E., & Soto, C. M. (2016). *Challenges and Solutions when using Technologies in the Classroom*. In S. A. Crossley & D. S. McNamara (Eds.) *Adaptive Educational Technologies for Literacy Instruction* (pp. 13-29). New York: Taylor & Francis.
- Kalimaposo, K., Moono, S., Daka, H., & Mulubale, S. (2023). AMBIA Perceived Challenges of ICT as an Examinable Curriculum Subject in Rural Secondary Schools: Voices of Teachers and Learners in Southern Zambia. *European Journal of Education Studies*, 10(10), 15-30.
- Kalyani, L. K. (2024). The Role of Technology in Education: Enhancing Learning Outcomes and 21st Century Skills. *International Journal of Scientific Research in Modern Science and Technology**, 3(4), 05-10.

- Kaumba, M., Mphahlele, R. S., Muleya, G., & Simui, F. (2021). Disablers and enablers in the uptake of information communication technologies in rural primary schools of Mwinilunga District, Zambia. *Journal of Educational Technology & Online Learning*, 4(1), 1-10.
- Makgati, O. M., & Awolusi, O. D. (2020). The Influence of Information Communication Technology (ICT) integration on teaching and learning in South African Schools. *Journal of Education and Vocational Research*, 10(2), 47-64.
- Ministry of General Education (2023). *Education Sector Strategic Plan 2023-2026*. Lusaka, Zambia.
- Ministry of General Education (2021). *Annual Report 2021*. Lusaka, Zambia.
- Ministry of Education, Zambia. (2020). *National ICT in Education Policy*. Government Printers.
- Mulima, O., & Simuchimba, M. (2022). Perceptions of teachers and learners on the use of ICTs in religious education in Zambia: A case of selected secondary schools in Kabwe District. *Zango*, 35, 74.
- Mumba, B. (2023). *Technological Advancement and Changing Skills: Imperative for a Paradigm Shift in Education Delivery in Zambia*. *Qeios*.
- Mumba, C. (2018). *Challenges and Opportunities of Integrating ICT in Teaching and Learning in Zambian Secondary Schools*. *International Journal of Educational Research and Development*, 4(1), 1-10.
- Mumba, C., & Banda, J. (2018). ICT integration in Zambian secondary schools: Challenges and Opportunities. *International Journal of Educational Development*, 58, 123-132.
- Mweene, V. M., & Banda, A. (2023). *ICT integration in Zambian high school STEM education*. In U. Ramnarain & M. Ndlovu (Eds.), *Information and Communications Technology in STEM Education: An African perspective* (pp. 35-56). Routledge Publishers.
- Nsama, P., Mwale-Mkandawire, M., Lisulo, S., & Hamweete, W. (2021). Challenges in the Investment of ICT Infrastructure at Secondary School in Zambia, in *Promoting Quality Education Delivery*. *International Journal of Research in Social Sciences and Humanities*, 5(7), 9-20.
- Nyanja, N. (2019). *A Review of the ICT Subject Implementation in Schools: A Perspective of Lusaka Province*. University of Zambia.
- Republic of Zambia. *Vision 2030*. (n.d) Lusaka: Government of the Republic of Zambia.
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1), 3-10.
- UNICEF (2022). *Digital Learning Report 2022: A Global Overview*. New York, USA.
- Zambia Institute of Advanced Technology (2022). *ICT Integration in Education: A Case Study of Zambian Schools*. Lusaka, Zambia.