The Use and Challenges of ICT in Primary Schools: A Study of Selected Primary Schools in Ilala, Tanzania.

Julius Jonas Mbawala, Slamet Lestari

Department of Educational Administration, Faculty of Education and Psychology, Yogyakarta State University, Indonesia.

ABSTRACT

The advancement of science and technology has led to profound changes in human life. The educational system, in particular, has greatly benefited from global progress, especially with the introduction of ICT. Today, teachers and students enjoy convenient access to vast information and resources through various technological tools like computers, tablets, smartphones, projectors, and online platforms. These developments have created opportunities for interactive and personalized learning experiences. In Tanzania, like other countries, ICT has been integrated into the education system. This study aimed to explore teachers' knowledge and understanding of ICT utilization and its integration in classrooms and the challenges encountered during implementation Deliberating to the objectives of this research, the design of this study is descriptive quantitative research using questionnaires to gather insights. The findings indicate that; teachers possess a certain level of ICT proficiency, enabling them to incorporate it into both their classrooms and daily lives. However, obstacles such as inadequate availability of ICT devices, unreliable internet connectivity, insufficient technical support, and a lack of professional training programs were identified as hindrances to the process. Based on these findings, the study provides recommendations for individuals, school administrators, and the government to ensure the successful integration of ICT in education.

Keywords*: ICT; Teachers' knowledge; Teaching and Learning; Tanzania.*

INTRODUCTION

The progress of science and technology worldwide has led to numerous changes evident in various fields. One noteworthy change is ICT, which has brought about significant transformations in sectors like education. ICT serves as a powerful tool for electronically creating, storing, displaying, sharing, exchanging, and conveying information [1] [2]. ICT are technologies that facilitate information access through communication devices such as computers, mobile phones, scanners, printers, and internet connections. Alongside computer hardware and software, ICT encompasses interactive digital content, the internet, satellite communication tools, radio and TV services, online content repositories, interactive forums, learning management systems, and management information systems [3] [4].

In an educational setting, ICT refers to a combination of technologies used in the processing and transmission of information for teaching, learning, and educational development [5]. It consists of a wide range of digitally accessible and deliverable platforms, tools, content, resources, forums, and services that can be utilized to advance teaching and learning objectives, enhance access to available resources, promote capacity development, and oversee the operation of the educational system [3]

The use of ICT has the potential to enhance both the learning and teaching processes for teachers and students in schools. Information and communication technologies empower students to analyze ideas through organization and manipulation, apply concepts in different contexts, and develop skills in assessing and solving problems [6]. Given the importance of preparing students with the knowledge and skills

required in the 21st century, there is increasing pressure on educational systems worldwide to integrate modern ICT into the learning environment [7].

Historically, Tanzania started to integrate ICT in teaching and learning back in the late 1960s and the beginning of the 1970s when radio programs and audiocassettes with prerecorded subject matter were used as a means of delivering teaching and learning resources in schools [8]. As the ICT rollout progressed, the Ministry of Education introduced a basic education ICT policy in 2007 and promoted ICT network development and employment in education institutions such as teacher colleges, non-formal education, and adult education [9]. The policy aligns with national development strategies and the overall objectives of education programs as it addresses various aspects such as infrastructure, curriculum and content, training and capacity building, procurement and administration, management, support, sustainability, and monitoring and evaluation [9] [10].

Through the implementation of this policy, students, teachers, educators, principals, and leaders are equipped with the necessary skills to effectively utilize ICT to enhance learning opportunities and ensure the quality and relevance of education [10]. In understanding the significance of incorporating ICT at all educational levels, the government of Tanzania introduced ICT subject in the primary school curriculum [11] to assist primary school pupils in developing their ability to search, write, communicate, and receive information from a variety of sources, which will enhance their communication abilities in academic, economic, and political settings using both conventional and cutting-edge technologies. [10] [11]. To enhance teaching and learning through the use of ICT, the government of Tanzania also gave tablets to all teachers from primary to high school [12].

Incorporating ICT into education is essential due to the growing significance of technology in all spheres of life (Hew and Brush, 2007). Numerous studies have demonstrated that ICT plays a valuable role in advancing the teaching and learning processes across all educational levels [13] [14] [15]. Other pieces of literature also have proved that to enhance the quality of instruction and learning within the classroom, educators must possess proficiency in the effective utilization of ICT [17] [18].

Although there has been considerable attention and a growing empirical foundation in research on the use of ICT in education, there are still some gaps in the existing literature. Numerous studies have emerged focusing on the impact of ICT in improving student achievement, as evidenced by works such as those by [19] [20] [21] [22] [23]. Additionally, various works of literature explore the influences and factors that shape the selection and utilization of ICT in the teaching and learning process, as studied by [18] [24] [25] [26]. Furthermore, issues related to integrating ICT into the classroom are investigated in works by [27] [28] [29] [30]. All of these pieces of literature were conducted in secondary schools and higher education institutions; this study, therefore, will seek to shed light on ICT integrations in Tanzanian primary schools, specifically in Ilala Municipal. Its objective is to find out to what extent primary school teachers understand information and communication technology, how they utilize it, and what problems they run into when using it. The following research questions will serve as the study's compass:

1. What level of knowledge do teachers in primary school have regarding (ICT) and its application in classroom learning?
2. What are the challenges facing primary school teachers when using ICT?

Various conceptual frameworks present in the literature have been utilized to examine and investigate the ICT knowledge of teachers. In 2006, Mishra and Koehler introduced the TPACK framework which serves as a theoretical basis for understanding and assessing teachers' ICT competencies. it is built upon Shulman's notion of PCK, which entails educators' specialized comprehension of effectively instructing a specific subject to a particular group of students. Teachers need to possess a deep understanding of the connections between technology and subject matter. They should know how technology can assist in teaching specific

content and how specific teaching methods can enhance the utilization of technology. Additionally, they should recognize how subject matter and teaching methods work together to promote effective learning. This knowledge is crucial for seamlessly incorporating technology into classroom settings. Researchers such as [31] [32] [33] [34] have employed this framework
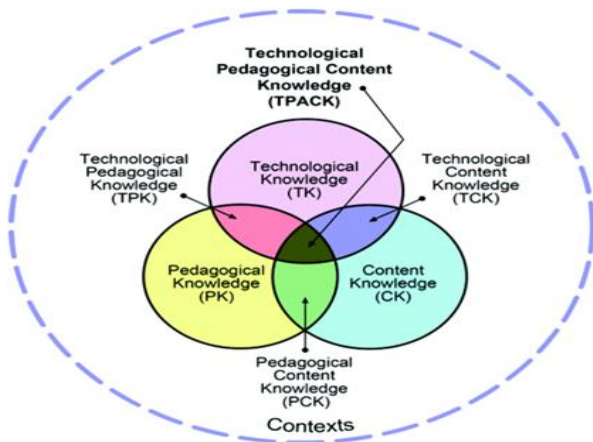

Figure 1: TPACK framework Mishra & Koehler, (2006)

On the other hand, [35] developed a new framework for digital literacy to deepen understanding of the use of ICT in the teaching and learning process. It adds to the body of knowledge that ICT proficiency encompasses more than just the ability to use technical tools [36] conversely use technology for multipurpose daily life [37] The proposed framework comprised three components including *Technical Dimension*: Possessing the technical and practical knowledge necessary to use ICT for learning and daily tasks, *The Cognitive Dimension*: The capacity to think critically while searching and evaluating digital information, as well as creating a cycle for processing digital information and the *Social-emotional Dimension:* Being able to use the internet responsibly for communicating, socializing, and learning by adhering to "netiquette".
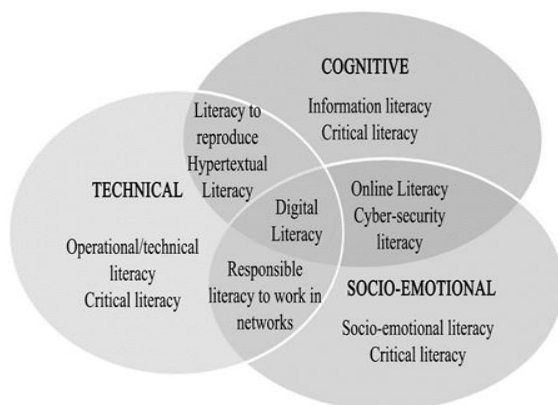

Figure 2: Digital literacy framework by Ng (2015).

The literature investigations have provided indications that expertise in these domains suggests that an individual is adept at utilizing technology effectively in their professional field [38] [39]. Consequently, it can be inferred that possessing digital competency will contribute to the development of TPACK competencies. Recent research conducted by [4] confirms a strong correlation between TPACK and the digital literacy model. Teachers who possess digital literacy competencies are capable of seamlessly integrating technology into the curriculum, thereby augmenting their knowledge of TPACK. By considering these two models, we can gain deeper insights into teachers' comprehension of the utilization of ICT in the teaching and learning process.

Many studies have presented the limited accessibility of ICT devices and network/internet connection to both teachers and students in the school and home environments as major challenges threatening ICT in education. According to the OECD's 2018 report on 79 countries, only 10% of students in disadvantaged schools in Brazil and Spain 470 had access to sufficiently powerful digital devices, with the availability of such devices differing by 40% points between advantaged and disadvantaged schools [40]. This is the same in the majority of developing nations where the power supply and network connectivity are still seen as the major problems. According to the study by [41], many schools in Afghanistan without power do not have access to the internet or other crucial online resources. Also, [42] despite Uganda having a large number of computers in school computer labs, many schools are not connected to the national grid. Also, [43] highlights that the main obstacles to the spread of advanced ICT in education in Rwanda, Burkina Faso, Cameroon, and Ghana are connectivity and access to reliable electricity.

Since several researchers identified a lack of technical support as one of the main obstacles to ICT usage in education, the use of ICT may be associated with several issues without both adequate technical support in the classroom and whole-school resources [44]. When seeking to incorporate ICT into their teaching practices, teachers frequently encounter technical hurdles, such as issues with hardware and software installation, maintenance, and troubleshooting, which encompassed delays in website loading, difficulties in establishing internet connections, printer malfunctions, computer malfunctions, and the necessity for teachers to utilize outdated computers [46] [47] [48].

The lack of adequately trained instructors and insufficient ICT knowledge and skills among teachers have been recognized as major obstacles to the integration of ICT in African schools [48] [49] On the other hand, in Germany, the ability of digital instructors and opportunities for teacher education to acquire digital competencies were key factors in the effective use of online learning during the COVID-19 school closure [50].

Time-consuming and additional work is reported to be another challenge facing teachers in implementing ICT in their classrooms. [51] explained that the preparation of a traditional lesson requires less time compared to a lesson aided by the use of technology. Teachers argue that they need time to prepare lessons accordingly by browsing internet sites, exploring educational software, and preparing technology- interceded lessons. Teachers, as per [52], express reluctance to spend their allotted 40 minutes for instruction on setting up computers and projectors or searching for equipment. In Saudi Arabia, educators argue that the limited 45-minute class period is inadequate for effective ICT use, deeming it time- consuming. Additionally, concerns are raised about losing control of crowded classrooms when incorporating ICT, as noted by [51].

Teachers' attitude toward ICT is another issue of concern. The researcher emphasizes that teachers' attitudes play an important role in the classroom process that involves the utilization of computers and internet connections. Several pieces of literature [53] [54] [55] suggest that teachers' attitudes toward technology are shaped by various factors. These factors include their perceptions of the technology's usefulness and ease of use, the level of training and support they receive, their beliefs about teaching and learning, as well as their personal experiences with technology [56] [57].

METHODS

This research was carried out by using a quantitative research design with a descriptive research method. A quantitative research design can often be used to generalize the findings of a study to a larger population. This is because the large sample size and objective measurement help to ensure that the results are representative of the population being studied. The study was conducted in primary schools located in

Majohe-Ilala council, the area was chosen based on the Singleton & Straits (2010) facts that the ideal research location is characterized by its relevance to the researcher's interests, convenient accessibility, and the potential to quickly establish a strong connection with the participants. The target population was teachers from five primary schools, which consisted of 150 teachers. Krejcie and Morgan Table (1970) used to draw 108 teachers as a sample size. As all teachers have an equal chance of being selected, a simple random sampling technique was used to get the study participants. The collection of data was done by distributing online questionnaires (Google Forms) to primary school teachers who were given time to complete the survey questionnaire. After completing to fill-in, the questionnaires were submitted online to the researcher for further data analysis. The data collected from the respondents were gathered, analyzed, and presented in percentages

RESULT AND DISCUSSION

Teachers' knowledge of ICT.

This section was divided into five categories based on two research frameworks adopted; digital literacy and the TPACK framework. The first dimension was intended to measure the knowledge of teachers on the use of ICT devices such as iPads/tablets, smartphones, computers, and projectors. They were asked whether they knew how to use different ICT devices.

Device	Yes	%	No	%
Tablet/iPad	78	72.2%	30	27.8%
Projector	70	64.8%	38	35.2%
Computer	72	66.7%	36	33.3%

Figure 3: Teachers' knowledge of ICT devices.

The second dimension was *Technological Content Knowledge*. Its' proficiency in ICT interaction in the classroom to create, design, and present subject matter was asked to be rated, and the answers were as follows;

Statement	Strong Agree	Strong Disagree
I can use spreadsheet software such (Microsoft Excel)	74 (68.6%)	29 (31.4%.)
I can use word processor software (Microsoft Word)	76 (70.3%)	32 (29.7%)
I can use presentation software (PowerPoint)	69 (63.9%)	39 (36.1%)
I can use animation software.	68 (63%)	40 (37%)

Figure 3: Teachers' Technological Content Knowledge.

In the third dimension, Teachers were requested to measure their integration knowledge of ICT with teaching approaches, the results illustrate that almost half of the surveyed teachers can use various technologies in assisting teaching approaches.

Statement	Strong Agree	Strong Disagree
Inquiry-based approach and ICT	72 (66.7%)	36 (33.3%)
Discovery-based and ICT	76 (70%)	32 (28%)
Collaborative approach and ICT	74 (68.5%)	34 (32.5%)
Direct instruction approach and ICT	71 (65.7)	37 (34.3%)

Figure 4: Technological Pedagogical   Knowledge.

The third dimension was intended to know teachers' knowledge on applying various ICT devices to deliver, present, and facilitate knowledge of the intended subject matter. The answers show teachers who responded strongly agree are almost half of the total respondents. This suggests that there is an ongoing requirement for teachers to incorporate ICT into their instructional methods, aligning it with the content being taught to enhance comprehension and easy understanding of content among students.

Statement	Strong Agree	Strong Disagree
I can teach topics with specific teaching approaches by using ICT	63 (68.6%)	(31.4%.)
I can combine strategies with content, ICT, and teaching approaches	76 (70.3%)	32 (29.7%)
I can solve problems through inquiry learning with ICT	69 (63.9%)	39 (36.1%)

Figure 5: Technological Pedagogical Content Knowledge.

Teachers' knowledge of ICT can not only be measured by content knowledge but also digital literacy can be used to understand more ICT. This part intended to know participants' digital competencies whether they can critically choose appropriate programs for teaching and learning, use the internet responsibly, respect and individual privacy. The result shows that 78% of teachers have the knowledge and ability to analyze and choose Internet programs that are suitable for learning. 78% of teachers report understanding the ethical, legal, and cyber issues related to the online copyrights of content that use digital resources. In using the internet responsibly, 84% of teachers can convey messages through the internet without misinterpretations and misunderstandings. Teachers are aware of personal rights and privacy as 87% report using the Internet while observing the security and privacy of other users. By being digitally literate, individuals gain control over their digital footprint, safeguard their data, and navigate the online world with confidence and awareness.

Problems facing teachers when using ICT.

Before the problems, participants were asked about their perceptions on the use of ICT as most reported that they felt comfortable and relaxed when using ICT to teach (77%), felt confident (87%), and were at peace when teaching by using ICT (88.8%). This data indicates teachers are ready and enthusiastic to apply ICT in classrooms.

It was discovered that each school has its own set of challenges with ICT integration into the teaching and learning process for elementary school teachers. 73% reported there is access to the internet in school but 62% concluded that they had access to stable and reliable internet. Accessibility of ICT devices at school was reported to be a big problem as only 59% were equipped with ICT devices while ICT technicians were reported to be an obstacle. Generally, problems reported in this study can be identified as follows;

- i. Inadequate availability of stable and reliable internet. ii. Inadequate ICT devices iii. Low number of ICT technicians.

ii. In-service training for teachers is reported to threaten the application of ICT in teaching as there are not enough teachers with ICT knowledge hence making it difficult to apply ICT in teaching.

iii. Limited time for teachers to apply ICT in class.

iv. Due to a lack of enough ICT devices sharing devices from one class to another takes time hence teachers fail to deliver the material as planned.

The research findings indicate that primary school teachers in Ilala municipal have knowledge and understanding of ICT and its application in teaching. Specifically, when it comes to ICT device knowledge, the participants demonstrated a higher level of familiarity with smartphones compared to computers/laptops, iPads, and projectors. This was expected as teachers use smartphones in everyday life compared to other devices. The lack of knowledge of some teachers on computers and projectors was interesting as these two devices are considered more important in classroom demonstrations and used to improve the efficiency and effectiveness of teaching and learning [58] [15]. Based on the 2021 statistics provided by the National Basic Education Statistics in Tanzania (BEST), it was found that in both primary and secondary public schools, there is a ratio of 371 pupils per shared ICT equipment, while for students in secondary schools, the ratio is 85 students per shared ICT equipment, this may seem to affect teachers as they lack access to devices in some schools. On the other hand, some teachers with access to devices were found less motivated to use ICT devices to prepare, teach, and present lessons [58].

Integration of ICT with teaching approaches was successful as a large number of teachers who participated in this study strongly agreed to know about interacting ICT with teaching methods. This shows teachers will find it easy to apply ICT in teaching. The same with table 3 shows most of the teachers reported being aware of interacting technology, content, and teaching pedagogy. This is what we call teaching and learning by using ICT. According to Erfan et al., (2022) possessing knowledge about technology, content, and teaching methods enables teachers to use and apply ICT in their classrooms. Consequently, teachers need to be adequately educated with such knowledge for an effective implementation of ICT in educational settings.

Regarding to digital literacy in daily life, teachers show the positive use of internet programs and platforms when preparing subject matter by observing the ethical, legal, and cyber issues related to the online copyrights of content that uses digital resources. According to [59] having proficiency in digital literacy involves being capable of utilizing different digital resources effectively and possessing the mindset of a digital user. The teacher's familiarity with digital literacy plays a crucial role in successfully discovering information. Hence, it is vital to enhance teacher digital literacy at both fundamental and continuous levels to enhance the overall quality of education [59].

The study's results indicate that problems in the implementation of ICT in primary schools range from poor internet stability, lack of enough devices, inadequate number of technicians, and in-service training for teachers. These problems are reported in most African countries and they relate in one way or another such as [60] in South Africa and East African countries [51] [61]

CONCLUSION

The research purpose was to gain an understanding of teachers' knowledge about the interaction of ICT and its problems. The result reveals that, to a large extent teachers have sufficient knowledge about ICT and its use in and outside of the class. Although some teachers reported to lack of this knowledge. Teachers reported being aware of digital literacy on the use of the internet positively while observing the privacy and copyrights of internet sources. The study also reports that a number of the challenges that face many African countries during the integration and implementation of ICT in the teaching and learning process are also reported in Tanzania.

Suggestions from this can be provided to individual teachers, school management, and the government. Individual teachers now can have access to ICT knowledge from different sources due to the development of technology, therefore individual knowledge updates on the use of ICT can first start within teachers as they are the ones responsible for improving student achievements that resulted in the modernization and improvement of the education system characterized by the integration of ICT as what global need. School management and other stakeholders have to work together to initiate different ongoing training programs on the use of ICT in the classroom to enrich teachers' understanding of ICT may result in school and individual performance. The usefulness of Technology in educational policy depends much on the government's strategies to distribute ICT devices, electricity, stable internet, ICT technicians, and infrastructures must be equally distributed to all schools. The policymakers should make sure that ICT is integrated into the curriculum and follow-up must be annually done to see its implementation for evaluation purposes.

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