



**TEACHER PREPAREDNESS AS A PREDICTOR FOR INTEGRATION OF ICT IN PEDAGOGY AMONG LOWER
PUBLIC PRIMARY SCHOOL GRADES IN KENYA**

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Harriet G. Isaboke

Research Fellow, Kenyatta University, Kenya

Accepted: March 12, 2018

ABSTRACT

This study examined teacher preparedness as a predictor for integration of ICT in pedagogy among lower and public primary school grades in Kenya. The study was guided by the following specific objectives; to examine the extent to which teacher training influences the use of ICT in the teaching-learning process and to assess the competency levels of lower primary school teachers in integrating ICT into pedagogical practices. The study employed a descriptive survey design, targeting 136 respondents at Borabu Sub-County, Nyamira County. A stratified random sampling technique was employed to categorize the 34 public lower primary schools across the four wards of Borabu Sub-County. The study utilized questionnaires and interview schedules for data collection. Data were analyzed using descriptive statistics, and multiple regression analysis was conducted to examine the relationship between the independent variables and dependent variable. The study found that teachers' training and ICT competency significantly influenced the integration of ICT in the teaching-learning process. The study recommended capacity building through Workshops and Seminars. Curriculum Enhancement in Teacher Training Colleges (TTCs) should also be considered.

Key Words: ICT, Electronic Learning, Digital Studies, Teacher Preparation

CITATION: Isaboke H. (2018). Teacher preparedness as a predictor for integration of ICT in pedagogy among lower public primary school grades in Kenya. *The Strategic Journal of Business and Change Management*, 5 (1), 1057 – 1067.

INTRODUCTION

Information and Communication Technology (ICT) plays a crucial role in modern curriculum implementation by fostering a dynamic learning environment where learners engage with knowledge in an active, self-directed, and constructive manner (Volman & Van, 2001). Around the world, governments have increasingly recognized the potential of ICT to transform education and have consequently made substantial investments to support its integration into teaching and learning processes. For instance, in the United Kingdom, the government invested £2.5 billion in educational ICT in the 2008–2009 financial year (Nut, 2010). Similarly, in the United States, government expenditure on ICT in K–12 schools and higher education institutions amounted to \$6 billion and \$4.7 billion, respectively, in 2009 (Nut, 2010). In New Zealand, the government allocates over \$410 million annually toward ICT infrastructure in schools (Calvert & Raggert, 2009).

Kenya has also made significant strides in promoting ICT in education. The National ICT Policy (2006) was developed to enhance the quality of life for Kenyans by providing accessible, efficient, reliable, and affordable ICT services (MoICT, 2006). This policy underscores the potential of ICT to improve the accessibility, equity, relevance, and quality of education at all levels. In alignment with this policy, the Kenya Institute of Education (now Kenya Institute of Curriculum Development – KICD) launched the Curriculum Digitization and E-Learning Strategy in 2011, aimed at promoting e-learning in public schools through the development and dissemination of digital educational content (KIE, 2011).

The integration of ICT into primary education is also one of the flagship initiatives of Kenya Vision 2030, which outlines the country's long-term development blueprint (Government of Kenya, 2013). In pursuit of this vision, the government rolled out a National Broadband Strategy, valued at Ksh 257 billion, to connect schools to high-speed and affordable internet services. Substantial

budgetary allocations have also been made to support ICT integration in education. For instance, in the 2013/2014 national budget, the government allocated Ksh 17.4 billion for the school laptop project, which focused on digital content development, teacher capacity building, and the establishment of computer laboratories in public schools. Additionally, the Digital Literacy Programme (DLP) received Ksh 24.5 billion in 2013/2014 and a further Ksh 17.5 billion in the 2014/2015 financial year for implementation in public primary schools across the country. By 2016/2017, over 1.3 million ICT devices had been distributed to public schools at a cost of Ksh 29 billion. To ensure full functionality of these devices, the government also connected schools to the national electricity grid, while schools in remote and off-grid areas were equipped with solar power kits and alternative energy solutions.

Despite these commendable efforts and substantial investments, several studies have reported that the integration of ICT in teaching and learning remains limited in many Kenyan public primary schools (Mwendwa, 2016; Wanyoike, 2015; Wafula, 2014). One of the key challenges identified is the insufficient preparedness of teachers to effectively utilize ICT in their instructional practices. Although teachers are central to the successful implementation of ICT programs in schools, the national ICT strategy has not adequately addressed the readiness of teachers in terms of their training, competence, and confidence in using digital tools (Laaria, 2013). This oversight poses a significant threat to the sustainability and effectiveness of ICT integration in the education sector. It is against this backdrop that the current study was undertaken. The study sought to assess the level of preparedness among public primary school teachers with a specific focus on their ICT training and competency. By evaluating these critical factors, the study aimed to provide insights into how teacher readiness can influence the successful integration of ICT in the teaching and learning process.

Statement of the Problem

The Government of Kenya has made commendable efforts to promote the integration of Information and Communication Technology (ICT) in primary education as a means of enhancing equity, access, and quality in the delivery of education. Several initiatives have been launched in pursuit of this goal, including the Laptop Programme for Grade One learners (Ministry of Education, 2014), the Computer Supply to Schools Programme (GoK, 2005), and the Provision of Digital Content to Schools (KIE, 2013). In addition to government efforts, educational institutions and publishers such as Longhorn Publishers, the Kenya Institute of Curriculum Development (KICD), and the Kenya Literature Bureau have significantly contributed to the development and dissemination of digital content specifically tailored for Grades 1 to 3 in public primary schools.

Despite these large-scale investments in ICT infrastructure and digital learning materials, numerous studies have revealed that the presence of ICT tools in schools has not necessarily translated into their effective use in teaching and learning (Mwendwa, 2016; Wafula, 2014; Wanyoike, 2015). The installation of technological devices and provision of internet connectivity alone have not resulted in widespread or meaningful ICT integration in classroom instruction. This points to a critical gap between ICT availability and its actual utilization in pedagogical practice.

A growing body of research emphasizes the importance of the "teacher factor" in the successful integration of ICT in schools. Teachers are not only implementers of educational technology but also key agents in shaping how ICT is used to support instruction. Without addressing the preparedness of teachers particularly their levels of training, competence, and attitudes toward ICT the effectiveness of ICT integration efforts remains limited. Inadequate teacher preparedness can lead to underutilization of available resources and the implementation of ICT strategies in a slow, inconsistent, and uncoordinated manner.

Notably, while various national-level studies have examined ICT integration in Kenyan schools, little is known about the specific readiness of teachers in lower primary schools, especially in Nyamira County. No comprehensive study has been conducted in this region to evaluate the extent to which lower primary school teachers are equipped, both in terms of training and competency, to integrate ICT in the teaching-learning process. It is against this backdrop that the current study was conceived. The study aimed to investigate the preparedness of public primary school teachers in Nyamira County to integrate ICT into classroom instruction, with a focus on assessing their levels of ICT training and competency. The findings of this study are intended to provide valuable insights that can inform targeted interventions and policy decisions aimed at enhancing ICT integration in the foundational levels of education.

Purpose of the Study

The purpose of this study was to investigate the preparedness of primary school teachers to integrate Information and Communication Technology (ICT) into classroom instruction, with specific focus on their levels of ICT training and competency. The study aimed to determine whether teachers possess the necessary skills and knowledge to effectively utilize ICT as a tool for enhancing teaching and learning in public primary schools.

Objectives of the Study

The study was guided by the following objectives:

- To examine the extent to which teacher training influences the use of ICT in the teaching-learning process.
- To assess the competency levels of lower primary school teachers in integrating ICT into pedagogical practices.

The study responded to the following research questions

- To what extent does teacher training in ICT influence its use in the teaching-learning process?

- What is the level of competency among lower primary school teachers in integrating ICT into pedagogy?

LITERATURE REVIEW

Benefits of ICT Integration

Information and Communication Technology (ICT) is widely recognized as a powerful catalyst for knowledge development and educational transformation. At the school level, ICT is seen as a critical tool for rethinking and redesigning educational systems and instructional processes, ultimately contributing to the provision of quality education for all learners (UNESCO, 2003). Unlike traditional teacher-centered methods, ICT facilitates a more learner-centered approach by offering diverse, engaging, and interactive activities that encourage students to explore, discover, and construct their own knowledge. The flexibility of ICT allows teachers to efficiently utilize a wide range of information and digital tools to support the achievement of instructional goals while catering to the varied educational needs of individual learners (Centre for Digital Education, 2010). Through this adaptability, ICT becomes an essential asset for inclusive and differentiated instruction in the classroom.

Integrating ICT into education is particularly valuable as it significantly improves access to learning materials, thus empowering learners with more knowledge and resources. It reduces the dependency on face-to-face instruction and promotes interactive, multimedia-rich learning environments that help sustain students' attention and motivation (Kaino, 2007). Furthermore, ICT has the potential to enhance learning outcomes by enabling teachers to implement effective instructional practices such as structured content delivery, efficient classroom management, development of quality learning materials, and accurate assessment methods (Kaino, 2008).

In primary education, ICT fosters collaborative and task-oriented learning experiences, encouraging peer interaction and group problem-solving. It also

enables the inclusion of diverse teaching resources, which can support students with special educational needs by accommodating different learning styles and abilities. This inclusive capacity makes ICT a valuable tool in promoting equity in education.

Moreover, ICT facilitates the adoption of innovative pedagogical approaches, including experiential and constructivist learning, where learners gain knowledge through active engagement and reflection. These methods help spark learners' interest, build intrinsic motivation, and promote positive attitudes toward learning. With ICT, educators can also develop enhanced assessment tools that go beyond rote memorization to evaluate deeper levels of understanding. For example, assessments may involve simulations, data analysis, or other interactive tasks that require critical thinking and problem-solving.

The use of ICT in primary education further allows both teachers and students to access a broad spectrum of digital learning resources available online. In the past, educational materials were largely limited to printed textbooks, which were often confined to physical school libraries or classrooms. However, advancements in technology have eliminated these constraints, enabling learning to occur anytime and anywhere. This shift has fundamentally transformed how educational content is accessed and utilized (Ajayi, 2008).

Through ICT, teachers can extend the learning experience beyond traditional classroom boundaries, promote active student participation, and create environments that encourage experimentation and exploration. The advancement of technology clearly signals a shift in the expectations of teaching professionals; teachers without ICT competence are increasingly being left behind. Educators equipped with the necessary ICT skills are better positioned to support academic achievement, as they can design and deliver instruction that meets the demands of 21st-century learners.

Teacher Training and Professional Development in ICT

Effective professional development and ICT training form the foundation of any successful technology integration program in education. Research indicates that teachers can effectively incorporate ICT into the teaching-learning process when they receive adequate training and ongoing professional development (Higgins, 2011). Conversely, a lack of such training often results in limited confidence and insufficient skills necessary to utilize technology effectively within the school environment. As Berker (1999) aptly notes, teachers can only deliver what they themselves have learned through their training; therefore, it is essential that they undergo comprehensive and high-quality training to facilitate meaningful use of ICT in classrooms.

Pelgrum (2001) emphasizes that the success of educational innovations is heavily dependent on teachers' skills and knowledge. His study identified teachers' lack of ICT-related competencies as one of the most significant barriers to effective technology use in schools. In line with this, Knezek and Christensen (2000) in the United States proposed that teachers with higher ICT proficiency are more likely to integrate technology effectively, which in turn positively influences student achievement. Their model suggests that educators equipped with advanced skills, knowledge, and appropriate tools are better positioned to implement ICT seamlessly in their instructional practices.

Furthermore, the relevance and quality of ICT training are critical. Training programs should equip teachers with practical skills and pedagogical strategies for integrating ICT, rather than merely focusing on operational or technical computer skills. Andoh (2012) points out that many teacher training institutions emphasize how to operate ICT tools instead of how to apply them effectively in classroom instruction. This observation aligns with Muriithi's (2005) findings, which highlight that ICT training in Kenya is often limited to basic computer literacy, resulting in a significant gap in pedagogical

integration among both primary and secondary school teachers.

Supporting this view, Agak (2010) reported that 55% of primary school teachers in Kenya lacked formal ICT training altogether, while 51% had pursued training independently, outside the formal education system. As a result, many teachers in Kenya feel inadequately prepared to integrate ICT into their teaching, a perception that negatively impacts technology adoption in schools. In response to this challenge, the Government of Kenya took steps to incorporate ICT training into the Kenya Primary Teacher Education (PTE) syllabus in 2008. However, despite this initiative, research shows that most teacher training institutions still emphasize basic computer operations, rather than instructional use of ICT. This narrow focus leads to insufficient preparation of teachers to utilize technology meaningfully in the classroom. Consequently, inadequate ICT training remains a critical barrier to consistent and effective ICT integration in Kenyan primary schools. Given these circumstances, it is essential to assess the extent to which primary school teachers are prepared and ready to implement ICT in line with curriculum demands, specifically by evaluating their levels of ICT competency and pedagogical application skills.

METHODOLOGY

Research Design

This study adopted a descriptive survey design, which facilitated the collection of both quantitative and qualitative data. As recommended by Orodho (2005), this design enabled the researcher to gather data that could be generalized to the broader population. The descriptive nature of the study also allowed for an in-depth exploration of the existing conditions related to the phenomenon under investigation.

Locale of the Study

The research was conducted in Borabu Sub-County, Nyamira County. This location was selected because previous studies indicated that while public primary schools in Nyamira County had received digital

learning devices from the government, full integration of ICT in teaching had not been realized (Angwenyi, 2016). Angwenyi further noted that although teachers are critical to ICT integration, their level of preparedness remained largely unexplored in this region.

Target Population

The study targeted 136 respondents, comprising 34 head teachers and 102 lower primary school teachers drawn from 34 public lower primary schools within the Sub-County. The focus on lower primary schools was due to the substantial ICT investments by the Government of Kenya in this educational level.

Sampling Technique and Sample Size

A stratified random sampling technique was employed to categorize the 34 public lower primary schools across the four wards of Borabu Sub-County. Within each stratum, purposive sampling was used to select head teachers and teachers of Grades 1, 2, and 3. A total of 10 head teachers and 31 lower primary teachers representing approximately 30% of the target population were purposively selected. According to Mugenda and Mugenda (2008), a sample size of 10–30% of the accessible population is adequate for descriptive studies. Thus, the study used a sample size of 41 respondents.

Research Instruments

The study utilized questionnaires and interview schedules for data collection. Questionnaires were ideal due to their cost-effectiveness, ability to provide ample response time, and reduction of researcher bias, as responses were given in the participants' own words. The teachers' questionnaire was divided into two sections focusing on the independent variables: ICT training and competency. ICT training was measured using items related to computer knowledge and skills, while competency was assessed using items focused on the ability to integrate ICT into classroom teaching.

Questionnaires were administered by the researcher and two trained research assistants, with logistical support from school head teachers, which contributed to a high response rate of 93.3%. Interview schedules were used to collect in-depth qualitative data from head teachers, particularly where abstract concepts or detailed explanations were needed. This tool allowed for clarification and verification of issues that could not be effectively captured through questionnaires. The open-ended questions encouraged descriptive responses and personal insights on ICT integration.

Pilot Study

A pilot study was conducted in two public primary schools within Borabu Sub-County that were excluded from the main study. The pilot helped refine the research instruments by identifying and correcting ambiguous or unclear items, thus improving both reliability and validity.

Validity and Reliability

Content validity was ensured through a two-step process. First, items were developed based on the study objectives. Second, each item was reviewed for clarity, language simplicity, and relevance to the objectives. Unclear or irrelevant items were revised or removed, while the most suitable ones were retained, ensuring the instruments effectively captured the intended constructs.

Reliability was assessed using the test-retest method. The instruments were administered twice, two weeks apart, to the same respondents in two different schools (excluded from the main study). The consistency of the responses was evaluated using Cronbach's Alpha, where a coefficient of 0.7 or higher indicated acceptable reliability (Mugenda & Mugenda, 2003). All instruments used in the study met this threshold, confirming their reliability.

Data Collection and Analysis Techniques

Data were collected using self-administered questionnaires for lower grade teachers and face-to-face interviews for head teachers, using structured interview guides. The data were

analyzed using descriptive statistics, and the findings were presented in tables and charts for clarity and easy interpretation.

RESULTS

Data was organized thematically and presented as per the study objectives. The researchers have tried further to invoke the views of other related studies on the similar subject.

Teachers' Training in ICT

The study sought to find out the extent to which teachers' training in ICT influence integration of ICT

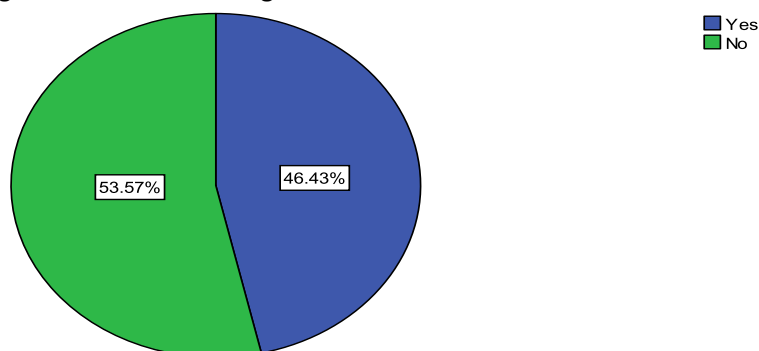


Figure 1: Trained teachers in ICT

The study established that majority of the respondents who had undergone training had basic ICT knowledge which they indicated were not good enough to help them integrate ICT in instruction. It was established that computer packages were the most level of training received by the respondents as presented by 25.0% and 17.9% certificate. None of the respondents had Diploma and Bachelor degree level of ICT training. These findings agree with Muriithi (2017) who found out that ICT skills

in teaching-learning. The researchers sought to establish; the number of teachers trained in ICT, teachers' level of training in ICT, attendance of teachers in workshops and in-service training and relevancy of the training in instruction. The findings from each area are discussed below.

Trained teachers in ICT

The study established that few of the respondents were trained in basic ICT skills as shown by 46.43% while majority were not by 53.57% as shown in figure 1 below.

are important to support ICT implementation in schools and poor teacher ICT skills has negatively affected implementation ICT education.

The findings further established that majority of the respondents received basic ICT training through Teachers Training Colleges (TTC) by 32.1%, 25.0% through the organization by their schools and 17.9% through commercial colleges as shown in table 1 below.

Table 1: Place of ICT Training

		Frequency	Percent	Cumulative Percent
Valid	Commercial college	5	17.9	23.8
	School organized	7	25.0	57.1
	TTC	9	32.1	100.0
	Total	21	75.0	
Missing	System	7	25.0	
Total		28	100.0	

This finding showed that teacher trainers do not go through training on how to integrate ICT in instruction when they are in training colleges; instead they receive basic computer knowledge on how to operate computers. This concurs with Wanyoike (2016) findings that most ICT training in Kenya are tied down to basic computer literacy as a result primary and secondary school teachers in Kenya do not have sufficient technology knowledge and skills on how to integrate ICT in the curriculum. These findings are shown in Table 1 above.

Attendance of ICT training/workshops

Majority of the respondents indicated that ICT training and workshops rarely took place which respondents indicated once a year. It was established that not all the teachers attended the

ICT trainings and workshops as presented by 60.7%, 25.0% were not sure and 14.3% agreed that teachers attended ICT training. This finding concurs with Angwenyi (2016) who found out that teachers did not enroll in in-service training and professional development courses which has a great set back to ICT integration. It also concurs with Rosenthal (1999) study found that ICT competence levels of teachers will impact their efficacy and determine how they will integrate ICT in schools and also Knezek and Christensen (2000) hypothesized that high levels of skills and knowledge would produce higher levels of technology integration that will reflect on student achievements positively The findings are presented in Table 2 below

Table 2: Attendance of ICT Trainings/Workshops

		Frequency	Percent	Cumulative Percent
Valid	Yes	4	14.3	14.3
	No	17	60.7	75.0
	Not sure	7	25.0	
	Total	28	100.0	

Those respondents who disagreed said that teachers have not been given an opportunity to attend the workshop and those few who attend are chosen by the head teachers because of lack of funds.

Relevance of ICT training in instruction

Respondents indicated that ICT training was very relevant as shown by 42.86%, 25.0% relevant, 21.43% slightly relevant and 10.71% not relevant as shown in Figure 4.5 below. The findings show that those teachers who attended ICT training and

workshops found the training very relevant in instruction, while few of them felt that the trainings were slightly relevant and a small number of the respondents who attended the ICT training found it not relevant in instruction. These findings disagrees with Alazam *et al.* (2012) which examined teachers' ICT skills and ICT integration and found out that a vast majority of teachers who participated in ICT training indicated it as irrelevant in classroom teaching.

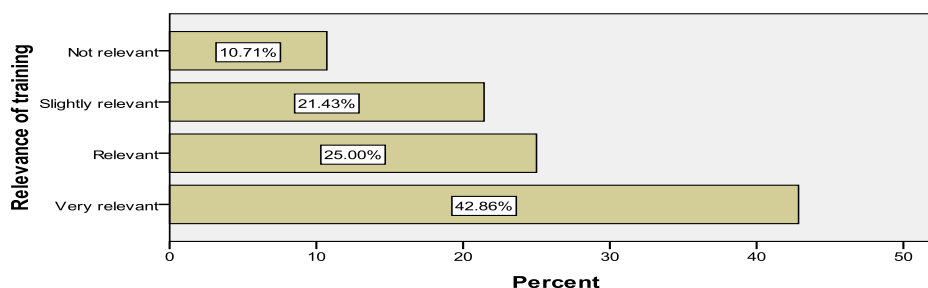


Figure 2: Relevance of ICT Training

The study established that most of the respondents who had training in ICT indicated that it had made their teaching more effective which led to improved performance among pupils in their class.

It was established that in-service training on ICT integration was rarely available for teachers in which majority attended ICT workshops/training once a year as indicated by 71.4% though 14.3% had not. This finding showed that there is not enough training that teachers are exposed to in order to help them upgrade and update their knowledge in ICT. Lack of appropriate ICT skills hinders integration of ICT in instruction. This is in

line with the study conducted by Baylor and Ritchie (2002); they found that professional development has a significant influence on how well ICT is embraced in the classroom. The respondents indicated that training helps to improve teachers to use ICT because it equips them with knowledge and skills that help them know how to use ICT equipment in class and improve their attitudes.

Teachers' Competency in ICT

The second objective of this study was to; establish lower grades' teachers' Competency in integrating ICT in pedagogy. Table 3 below summarizes the findings.

Table 3: ICT Competency

	Yes (%)	No (%)
I can connect computer cables to electricity and switch ON or OFF a computer	42.9	57.1
I can open, close, save and rename a file	67.9	32.1
I can search the internet for educational reference materials	50.0	50.0
I can use the internet for e-mailing other teachers, parents and pupils on issues related to teaching and learning	50.0	50.0
I can scan for viruses and fix basic faults (trouble shoot)	53.6	46.4
I can use Word Processor e.g. MS Word to type lesson materials	17.9	82.1
I can use Spreadsheets e.g. MS Excel to perform Arithmetical calculations and plot graphs	0.0	100.0
I can use Presentation software e.g. PowerPoint for class presentation	21.4	78.6
I can use databases e.g. Access to store pupils personal and performance records	0.0	100.0
I can use digital camera and a computer to produce a video for classroom presentation	42.9	57.1

The study revealed that none of the respondents possessed knowledge in using spreadsheet applications such as Microsoft Excel for performing arithmetic calculations, generating graphs, or managing databases like Microsoft Access for storing pupil records and performance data. Additionally, a significant proportion of respondents indicated that they were unable to use word processing software (e.g., MS Word) for typing lesson materials, presentation software (e.g., PowerPoint) for delivering classroom presentations, or operate digital cameras and computers to create instructional videos. Specifically, 82.1% could not use word processors, 78.6% could not use presentation tools, and 57.1% lacked the skills to produce videos. These results suggest that a majority of teachers lacked sufficient ICT knowledge

and skills, which significantly hampered their ability to integrate ICT into the teaching-learning process. This aligns with Pelgrum (2001), who emphasized that the success of educational innovation is highly dependent on the ICT skills and competencies of teachers.

However, the study also found that 67.9% of the respondents were able to perform basic computer operations such as opening, closing, saving, and renaming files. Additionally, 50% of teachers indicated they could search the internet for educational resources and use email to communicate with fellow teachers, parents, and learners on instructional matters. Despite these basic capabilities, it was evident that the overall ICT competence among teachers was low, with most

possessing only elementary knowledge that is insufficient for effective integration of technology in instruction. These findings are consistent with Rosenthal (2000), who noted that a teacher's level of ICT competence directly influences their effectiveness and willingness to integrate technology in teaching. Similarly, Muriithi (2017) identified lack of ICT skills and knowledge as a major barrier to ICT adoption in schools. Based on these findings, it can be concluded that there is a pressing need for comprehensive ICT training programs for lower primary school teachers to enhance their competence and enable effective integration of ICT in pedagogy.

CONCLUSION & RECOMMENDATIONS

The study found that teachers' training and ICT competency significantly influenced the integration of ICT in the teaching-learning process, as demonstrated by the statistical results ($t = 1.558$, $p < 0.05$). Most respondents had undergone basic computer literacy training primarily offered in Teacher Training Colleges (TTCs). The training was largely limited to basic computer packages, equipping teachers with only fundamental skills such as operating computers, which were not sufficient for meaningful ICT integration in pedagogy. Consequently, the majority of teachers reported low levels of ICT use for instructional purposes, highlighting a gap between training content and pedagogical application.

The study concludes that while most primary school teachers possess basic computer operational skills, they lack sufficient ICT competency necessary for effective instructional integration. This limited proficiency hinders the adoption of ICT in teaching and learning. Therefore, there is a critical need for comprehensive, pedagogically oriented ICT training

to equip teachers with practical skills relevant to instructional contexts. The study reinforces that teachers' ICT competency is a significant predictor of the successful integration of technology in education. As such, enhancing teachers' capacity to utilize ICT for educational purposes is vital for the success of ICT initiatives in schools.

Based on the study findings, the following recommendations were made:

- Capacity Building through Workshops and Seminars. The Ministry of Education should organize regular workshops and sensitization seminars targeting in-service and long-serving teachers. These forums should focus on the practical application of ICT in education, helping teachers to acquire skills not included in earlier teacher training curricula.
- Curriculum Enhancement in Teacher Training Colleges Teacher Training Colleges (TTCs) should review their curricula to incorporate pedagogical applications of ICT, not just basic computer literacy. ICT training should emphasize how to utilize technology in classroom instruction, enabling pre-service teachers to graduate with skills directly applicable to current teaching demands.
- Continuous Professional Development School management bodies should promote and support ongoing professional development and in-service training. Teachers should be encouraged to enroll in ICT-related courses to enhance their skills, remain updated with technological advancements, and improve their capacity to integrate ICT effectively in the classroom.

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