



Influence of Teacher's Use of Digital Tools on Their Competency in Designing and Implementation of Creative Learning Activities in Primary Schools in Nandi County

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Abstract: Primary school teachers often struggle to integrate creativity into their teaching due to limited exposure to digital resources, resulting in less engaging and less effective learning experiences. Therefore, this study aimed to assess how the use of digital tools impacts the successful design and implementation of creative learning activities by teachers in primary schools. The study was guided by Technological, Pedagogical and Content Knowledge (TPACK) model. The study adopted descriptive research design. The target population was 6717 (773 head-teachers and 5944 teachers) drawn from the six sub-counties in Nandi County. Yamane formula was used to sample 378 respondents comprising (44 head-teachers and 334 teachers). The study used stratified sampling to select schools and simple random sampling to select 334 teachers and purposive sampling to select 44 headteachers. The research instruments were Questionnaires for teachers and interview schedules for headteachers. The study found that teacher's use of digital tools had a positive and statistically significant effect on the designing and implementation of creative learning activities in primary schools in Nandi County, Kenya ($\beta_1=0.109$; $p<0.05$). Qualitative data from headteachers stated that [1] majority of teachers are aware of digital tools but lack the necessary training to use them effectively, which impacts their classroom performance. The study concluded that the use of digital tools significantly influences teachers' competency in designing and implementation of creative learning activities in primary schools. The study recommends for implementation of comprehensive technical support systems for primary school teachers to address challenges related to digital tool usage.

Keywords: Digital tools, Teachers' competency, Designing and implementation, Creative learning

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1. Introduction

In the 21st century, the use of digital tools in the field of education is increasingly advanced (Saykılı, 2019). Digital competency can contribute to creativity if taught or embedded into a lesson with the focus being to create something different (Janse van Rensburg, Coetzee & Schmulian, 2022). For children to be creative they need to be taught how to do this. Within the use of digital

competency children can experiment independently which should result in the child understanding there are a range of ways to present a piece of work. Children should be taught to use digital competency tools through guided discovery. While they should have the freedom to interpret tasks in their own way, they must also understand the purpose of the task and how to be original

in order to express creativity effectively (Guillén-Gámez et al., 2022).

Digital competency is the result of the interaction of cognitive, socio-emotional, and technical components (ElSayary, Mohebi & Meda, 2022). In other words, digital competency is a combination of knowledge about tools (competencies using software and hardware), critical capabilities (evaluation and contextualization) and social awareness (understanding self-identity, collaboration, and communicating with the audience in certain contexts). Digital competency is attributed to the skills, knowledge, and understanding required to reinvigorate digital participation in professional and social life (Mukherjee, 2023).

Digital information and communications technologies (ICT) can be seen as a set of tools which can be chosen as and when they are appropriate in the creative process (Sunday & Vera, 2018). The use of digital competency skills in teaching is more likely if the tools and resources of the Internet, multimedia, and related technologies are seen as being integrally connected with competency learning in the wider sense of learning as a matter of accessing information, communicating, and applying knowledge (Suartama, Setyosari & Ulfa, 2019).

In Ethiopian universities some instructors have never had an opportunity to use computers for educational purposes nor have received any training in this regard (Tefera, Goeman, Bekele, Van Petegem & Elen, 2022). In Kenya, a government initiative provided schools with digital competency tablets, and teachers were trained on how to use them for teaching (Olofsson, Fransson, & Lindberg, 2020). To ensure schools are using digital competency tools in teaching, efforts to create an enabling environment for ICT use in schools have been ongoing, and appropriate policies have been formulated. However, despite these efforts, many schools still face challenges in effectively integrating digital tools into classroom practice due to limited infrastructure, inconsistent internet access, and varying levels of teacher preparedness.

1.1 Statement of the Problem

The integration of digital tools in educational settings has been widely studied. For instance, Kali *et al.*, (2019) introduced the TPACK framework to conceptualize the intersection of technology, pedagogy, and content knowledge. Similarly, Hennessy *et al.*, (2022) highlights the challenges in developing countries, where limited access and insufficient training impede effective technology use in classrooms. Previous studies, such as Kibuku, Ochieng & Wausi, (2020) have identified specific barriers in Kenya, including inadequate technical support and limited digital resources. This study aims to build on these findings by systematically examining the current state of digital literacy among primary school teachers in Nandi County and its impact

on creative learning activities. Teacher digital competency in the use of digital tools is expected to improve creativity and innovation in both teachers and learners, leading to improved standards of educational outcomes.

The need to develop digital literacy and creativity among learners is, therefore, increasingly being felt in the context of CBC in Kenya. These two competencies are crucial in providing students with the skills needed for the 21st century. However, studies have shown that many teachers are unable to effectively deliver these aspects of CBC as a result of a lack of competence in both digital tools and innovative teaching methods. For instance, there is evidence that teachers are challenged in integrating digital tools into their pedagogy due to a system of inadequate training and limited resources. Equally, other studies show that teachers have fallen short in developing the creativity of learners because many teachers have continuously used traditional, examination-oriented teaching approaches, instead of embracing learner-centered, exploratory methods advocated for by CBC.

However, the current challenges include limited access to available digital tools, a lack of appropriate digital resources, and insufficient digital literacy among teachers. These issues hinder the effective integration of digital technologies in classrooms, preventing the development of digital competencies necessary for modern educational practices. These factors hinder the use of digital tools and technologies that could build digital capabilities in their learners that will support them to use new and emerging technologies in their future classrooms and enhance quality education.

In light of limited access to digital tools and resources, the question remains whether; teacher digital literacy in using digital tools and resources in primary school is capable to enhance competencies in designing and implementation of creative learning activities. It is crucial to invest in continuous professional development programs that focus on enhancing teachers' digital skills and their ability to nurture creativity. This includes providing practical training in ICT tools, fostering an innovative teaching mindset, and ensuring adequate infrastructural support in schools. Such efforts would not only align with the CBC's objectives but also prepare learners to thrive in a dynamic, technology-driven world. This study sought to investigate teacher digital literacy on teacher competency in designing and implementation of creative learning activities in primary school in Nandi County, Kenya.

1.2 Objectives of the Study

This study set to examine the influence of teacher's use of digital tools on their competency in designing and implementation of creative learning activities in primary schools in Nandi County.

1.3. Research Hypothesis

H₀: There is no statistically significant relationship between teachers' use of digital tools and their competency in designing and implementing creative learning activities in primary schools in Nandi County.

1.4 Significance of Study

The findings of this study will be helpful to the Ministry of education as it may consider training more teachers on use of digital tools and resources to ensure the overall objectives of new curriculum are met. Additionally, the teachers will find the outcome of this research important as they will understand the integration of digital resources into their teaching methods with the key to enhancing the learner's creativity in class. Other scholars will benefit from the additional materials added into the vast knowledge of already growing research in digital technologies adoption in primary schools. Educators can gain insights into the factors that influence the effectiveness of using technology tools and resources in designing and implementing creative learning activities.

1.5 Scope of the Study

This study is to establish teachers' digital literacy on teacher competency in designing and implementation of creative learning activities in primary schools in Nandi County, Kenya. The independent variables were teachers' use of digital tools. The dependent variable was the teacher's competency in designing and implementation of creative learning activities. The target population was 3702 Primary school teachers and 773 headteachers from six sub-counties in Nandi County. The study adopts a mixed-method research design, integrating both quantitative and qualitative approaches. This study was conducted between November 2023 and July 2024.

1.6 Theoretical Review

The study was also guided by Technological Pedagogical and Content Knowledge (TPACK) Framework Model which was advanced by Mishra and Koehler's in 2006. Mishra and Koehler created a new framework which adds technology to pedagogical content knowledge and emphasizes the connections, interactions, and constraints that teachers work with in all three of these knowledge areas.

According to the TPACK framework, specific technological tools like hardware, software, applications,

associated information literacy practices are best used to instruct and guide students toward a better, more robust understanding of the subject matter. The three types of knowledge – TK, PK and CK – are thus combined and recombined in various ways within the TPACK framework (Qosim & Sutiono, 2021). Technological pedagogical knowledge (TPK) describes relationships and interactions between technological tools and specific pedagogical practices, while pedagogical content knowledge (PCK) describes the same between pedagogical practices and specific learning objectives; finally, technological content knowledge (TCK) describes relationships and intersections among technologies and learning objectives. These triangulated areas then constitute TPACK, which considers the relationships among all three areas and acknowledges that educators are acting within this complex space (Chen, Li & Xu, 2022).

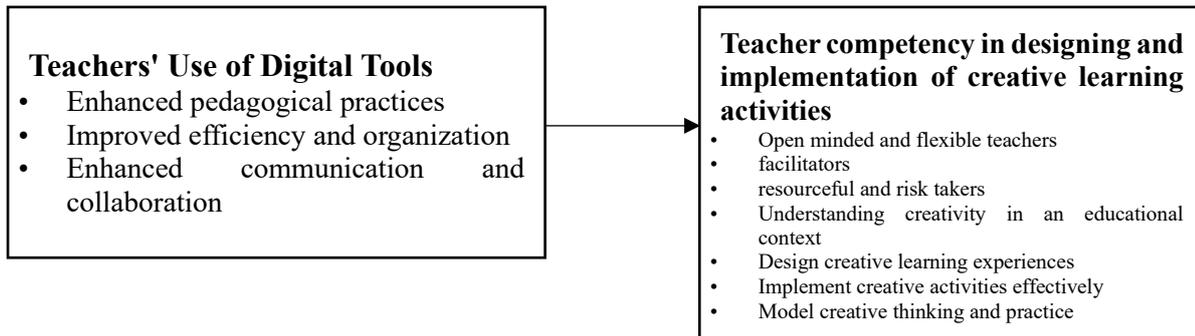
TPACK considers the different types of knowledge needed and how teachers themselves could cultivate this knowledge, the TPACK framework thus becomes a productive way to consider how teachers could integrate educational technology into the classroom. Then too, TPACK can also serve as a measurement of instructor knowledge, potentially impacting both training and professional development offerings for teachers at all levels of experience. Finally, the TPACK framework is useful for the ways in which it explicates the types of knowledge most needed in order to make technology and digital literacy successful in the classroom (Tseng, Chai, Tan & Park, 2022). This theory provides a foundation on Teacher Digital Literacy and its impact on the competency of teachers to design and implement creative learning activities among Primary Schools in Kenya. The model shows how three major domains converge: Technological Knowledge, or TK; Pedagogical Knowledge, or PK; and Content Knowledge, or CK-developed and required to be put together for teaching in contemporary educational settings.

Teacher digital literacy is directly related to the Technological Knowledge (TK) aspect of TPACK. Digital literacy entails the ability of teachers to adopt digital tools, technologies, and platforms in enhancing learning. This is especially crucial within the Kenyan Competency-Based Curriculum (CBC), where the adoption of technology is encouraged toward driving innovation and creativity within learning activities. The study explores how digital literacy influences teachers' capability in integrating technology into their teaching practices.

1.7 Conceptual Framework

Independent Variables

Dependent Variable



2. Literature Review

2.1 Empirical Review

The use of digital tools in education continues to be analyzed, especially in industrialized nations where the utilization of technology in classrooms is widespread. A study conducted by Nkambule (2020) in the United States applied the Technological Pedagogical Content Knowledge (TPACK) framework. This framework, originally developed to highlight the importance of integrating technology, pedagogy, and subject knowledge, aims to improve teacher competency. Bereczki and Kárpáti, (2021) observed that teachers who skillfully incorporate digital resources into their teaching methods are more adept at creating and executing innovative learning activities. According to Sharma (2022), digital tools like interactive whiteboards, instructional software, and internet resources offer a wide range of possibilities for innovative teaching and learning. The study emphasized notable challenges, such as the requirement for continuous professional growth and the inequalities in technological accessibility. This indicates a lack of comprehension regarding the fair and equal integration of these tools in diverse educational environments, especially in settings with minimal resources which brings a gap that the current study sought to fill.

In their study, Soroko and Mykhailenko (2019) investigated how digital technologies contribute to the development of creative learning environments in European schools. The study utilized a mixed-methods approach, integrating quantitative surveys with qualitative case studies. The results demonstrated that the utilization of digital technologies such as tablets, learning management systems, and virtual reality apps had a substantial positive impact on student engagement and creativity (Liu et al., 2020). Teachers who underwent training in utilizing these tools reported a noticeable boost in their confidence and proficiency in incorporating them into their lesson plans. However, the study also observed that in the absence of adequate

infrastructure and support, the full potential of digital tools cannot be effectively harnessed. This underscores the necessity to investigate the infrastructural and contextual obstacles encountered by instructors, especially in developing countries.

Within Sub-Saharan Africa, the integration of digital tools in education has progressed at a somewhat sluggish pace. However, numerous studies have emphasized the potential influence of these tools in enhancing teacher proficiency and improving student learning outcomes. A study conducted by Chisango and Marongwe (2021) in South Africa investigated the utilization of digital tools in primary schools and its impact on teaching methodologies. According to their study, the use of digital resources such as laptops, projectors, and instructional software enhanced the level of interactivity and engagement in learning. Teachers who demonstrated proficiency in utilizing these technologies were capable of implementing a greater variety of innovative and student-focused learning activities. The study pinpointed notable obstacles, such as restricted availability of technology, insufficient technical assistance, and inadequate possibilities for professional growth. The results emphasize the necessity for more extensive approaches to assist teachers in incorporating digital resources into their teaching methods (Abedi, 2023).

A study was undertaken by Adeboye and Adeyiwolu, (2024) in Nigeria to examine the influence of digital technologies on the process of teaching and learning in primary schools. Their study utilized a survey methodology, gathering data from both teachers and students. The results suggested that the use of digital resources, such as educational applications, e-books, and online collaboration platforms, improved instructor proficiency and increased student involvement. According to Al-Bogami and Elyas (2020), teachers who successfully utilized digital tools had enhanced self-assurance and capability in carrying out innovative educational activities. The report emphasized obstacles such as inadequate internet connectivity, limited availability of digital devices, and insufficient training for educators. These issues indicate the necessity for

specific initiatives to facilitate the incorporation of digital tools in educational environments, especially in rural and underprivileged regions.

In Kenya, recent educational changes have prioritized the incorporation of digital tools in education, exemplified by the government's creation of the Digital Literacy Programme (DLP). A study done by Kyalo (2021) found that having basic infrastructure and facilities that meet minimum building standards is crucial for effective learning. Similarly, selecting appropriate digital learning devices is vital for successful digital education. Business continuity plans are also essential for implementing digital literacy initiatives. However, several challenges hinder the program's implementation, including insufficient training for relevant stakeholders, a lack of adequate learning devices, frequent power outages, limited human and financial resources, poor promotion of the Digital Literacy Program (DLP), misalignment between the existing Competency-Based Curriculum and the DLP and a lack of internet access.

A study conducted by Temba *et al.*, (2023) in Kilimanjaro Region, Tanzania examined the utilization of digital tools in primary schools and assessed their influence on teaching methodologies. The results suggested that educators who proficiently utilized digital resources such as tablets, projectors, and instructional software were capable of devising and executing more innovative and captivating learning experiences (Walan, 2020). These educators experienced a boost in their self-assurance and proficiency when it comes to incorporating digital resources into their teaching methodologies. The study emphasized challenges such as availability of technology, insufficient technical assistance, and inadequate possibilities for training.

However, this work is differentiated from our study due to the fact that Oke, Arowoia and Ekundayo (2021) address technology in the Nigerian construction industry while this project focuses on the influence of digital technology in creative design education. Additionally, the choice of location, population size, and the category of population in both studies are dissimilar. Regarding the use of digital tools in teaching situations. The findings revealed that technologies are enablers of knowledge extraction, sharing and dissemination. Additionally, they have significantly impacted the SECI knowledge creation processes of socialization, externalization, combination and internalization.

Additionally, problems such as power blackouts, incomplete number of devices for students, copyright infringement and plagiarism were recorded. Similarly, Conrad and Openo, (2018) published a report that aimed to determine if, compared to traditional practice, digital practice increased student measuring accuracy on an authentic task. The study explored the relative efficacy of digital versus traditional practice for increasing

student measurement skills in applied situations. The findings suggested that student outcomes from digital practice are at least comparable to the outcomes of students who engage in traditional practice. The study is related to this research work in terms of the effectiveness and best practices for effective use of technologies for educators. The difference is that the reviewed work sought to determine if, compared to traditional practice, digital practice increases student measuring accuracy on an authentic task while our ongoing research focuses on the impact of digital tools for teaching and learning (Bernacki, Vosicka, Utz & Warren, 2021).

While many studies focus on specific regions or demographics, leading to questions about the generalizability of findings. For instance, research predominantly conducted in industrialized nations may not adequately represent the challenges faced in developing countries. Numerous studies highlight the importance of adequate infrastructure and support systems for effective digital tool integration. However, there is insufficient exploration of how varying levels of infrastructure impact teacher training and student engagement across different educational contexts. There is a lack of comparative studies that examine the effectiveness of digital tools across different geographical contexts, which could provide insights into best practices and contextual adaptations.

3. Methodology

3.1 Research Design

Research design refers to the overall strategy used to integrate the different components of the study in a coherent and logical way (Karunarathna, Gunasena, Hapuarachchi, & Gunathilake, 2024). This study adopted a mixed-methods research design, which integrates both qualitative and quantitative research approaches. This design was chosen to enable triangulation of data and gain a comprehensive understanding of the research problem by combining statistical trends with participants' perspectives.

3.2 Study Area

The study was conducted in Nandi County, located in the Rift Valley region of Kenya. Nandi County comprises six constituencies: Chesumei, Emgwen, Mosop, Aldai, Tinderet, and Nandi Hills. The region is predominantly rural, with a large number of public primary schools dispersed across its sub-counties.

3.3 Target Population

The target population for this study consisted of 6,717 individuals, including 773 head teachers and 5,944 teachers from 773 public primary schools in Nandi County.

3.4 Sampling and Sample Size

The study used a stratified sampling technique to categorize schools according to sub-counties. From each stratum, schools were selected proportionally based on the number of schools in each sub-county. Within each selected school, purposive sampling was used to identify one head teacher for participation, given their administrative knowledge and experience. Teachers were selected randomly within the sampled schools.

The final sample size was 378 respondents, including both teachers and head teachers, determined using Yamane’s formula (1967) for sample size calculation based on the known population ($n = N / [1 + N(e)^2]$).

3.4 Data Collection Tools

The study employed two main tools for data collection; Questionnaires for teachers: These were structured to collect quantitative data on teachers’ perceptions, experiences, and practices.

Interview schedules for head teachers: These were semi-structured to allow for in-depth qualitative insights into leadership roles, policy implementation, and school-level challenges.

3.5 Data Collection Procedure

Before data collection, the researcher obtained the necessary research permits from the National Commission for Science, Technology, and Innovation (NACOSTI) and consent from the County Education Office. The researcher visited schools personally and administered the questionnaires to teachers and conducted interviews with head teachers on-site. Data collection was carried out during school working hours to ensure maximum participation and cooperation.

3.6 Data Analysis

Quantitative data obtained through questionnaires were coded and analyzed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used. Qualitative data from interviews were analyzed using thematic analysis, where key themes and patterns were identified, coded, and interpreted in relation to the research objectives.

3.7 Ethical Considerations

Ethical standards were strictly observed throughout the study. Participants were informed of the study’s purpose, and informed consent was obtained before participation. Anonymity and confidentiality were assured, and participants were allowed to withdraw from the study at any point without any consequences. The research adhered to the ethical guidelines outlined by the Kisii University Research Ethics Committee.

4. Results and Discussion

The response rate for the study was determined and analyzed to assess the level of participation from the surveyed participants. Out of the 378 administered questionnaires to teachers, 289 were returned for data analysis, yielding a response rate of 76.45%. Also, out of 44 headteachers sampled the saturation point arrived at 35 giving a response rate of 79.5%. This response rate is considered good to enable the determination of teacher digital literacy on teacher competency in designing and implementing creative learning activities in primary schools in Kenya.

4.1 Reliability Test

The pilot study results of internal consistency reliability are presented in Table 1.

Table 1: Reliability Test

Objectives	Cronbach’s Alpha	N of Items
Teacher use of digital tools	.856	13

4.2. Descriptive Analysis

The study sought to examine the influence of teacher’s use of digital tools on their competency in designing and

implementation of creative learning activities in primary schools in Nandi County as shown in Table 2.

Table 2: Teacher use of digital tools

Variable	Number of Items	<i>M</i>	<i>SD</i>
1. Teacher Use of Digital Tools	13	3.18	1.119

The study findings in Table 2 show the influence of teachers' use of digital tools on their competency in designing and implementing creative learning activities. With 13 items assessing this variable, the mean score of 3.18 indicates a moderate use of digital tools among teachers. However, the standard deviation of 1.119 suggests considerable variability in their use, pointing to a need for more consistent and widespread adoption of digital tools in the classroom to enhance teaching effectiveness and creativity. Foulger, Graziano, Schmidt-Crawford, and Slykhuis (2017) argue that the effective use of digital tools can significantly enhance teaching

and learning, supporting the need for increased and consistent use of such tools among teachers. Additionally, Ertmer and Ottenbreit-Leftwich (2013) emphasize that teachers' ability to effectively integrate digital tools is crucial for fostering innovative pedagogical practices, classroom efficiency, organization, enhanced communication, and collaboration and thus improving learner outcomes.

4.3 Correlation Analysis

Table 3: Correlation between Use of Digital Tools and Implementation of Creative Learning Activities

		Implementation of creative learning activities
Use of Digital Tools	Pearson Correlation	.394**
	Sig. (2-tailed)	.000
	N	289

** . Correlation is significant at the 0.01 level (2-tailed).

The findings shown in Table 3 indicated that teacher use of digital tools has a positive and statistically significant correlation on the designing and implementation of creative learning activities in primary schools in Nandi County, Kenya ($r = 0.394$, $p < 0.05$). This implies that teachers who effectively utilize digital tools are better equipped to design and implement creative learning activities. This finding aligns with Karchmer-Klein

(2020), who found that the integration of digital tools can enhance teaching practices and student engagement, though they note the necessity of proper training and support for effective implementation.

4.4 Hypotheses Testing

Table 4: Hypotheses Table

Hypotheses	Results	Decision rule(accept/reject)
H₀₁ : There is no statistically significant influence of teachers' use of digital tools on teacher competency in designing and implementation of creative learning activities in primary schools in Nandi County.	$\beta_1=0.109$; $p < 0.05$	Rejected the null hypothesis

Table 4 presents the findings of hypothesis testing. The hypothesis (**H₀₁**) revealed a statistically significant relationship between teachers' use of digital tools and teacher competency in designing and implementation of creative learning activities in primary schools in Nandi County ($\beta_1 = 0.109$, $p = 0.000$). This result leads to the rejection of the null hypothesis (**H₀₁**), which stated that there is no significant relationship between digital tools and teacher competency. The implication is that the effective use of digital tools can significantly enhance teachers' ability to design and implement creative learning activities. Harris and Hofer (2017) support this

finding by emphasizing that digital tools, when integrated effectively, can substantially improve teaching outcomes and student engagement.

5. Conclusion and Recommendations

5.1 Conclusions

The findings conclusively demonstrate that the use of digital tools, innovative pedagogical approaches, digital content creation and digital citizenship significantly influence teachers' competency in designing and

implementation of creative learning activities in primary schools in Nandi County.

5.2 Recommendations

The study recommended comprehensive technical support systems for primary school teachers to address challenges related to digital tool usage. This should include localized capacity building and professional development such as tailoring and continuous digital teacher training session (Continuous professional development) that goes beyond basic digital literacy to focusing on the pedagogical integration of digital tools within the CBC framework.

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