AJOTE
African Journal of Teacher Education
ISSN 1916-7822. A Journal of Spread Corporation

Volume 13 No. 2 2024 Pages 13-33

The Impact of UNESCO MGIEP Digital Teacher Training on Nigerian Educators' Digital Pedagogy Competence and Confidence

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ABSTRACT

This study explores Nigerian educators' perceptions of digital pedagogy competence and the impact of a UNESCO MGIEP digital teacher training course. The study employs a validated survey and paired sample t-tests to assess the efficacy of a 5-week intervention delivered through synchronous and asynchronous modes. The findings reveal statistically significant improvements in educators' digital pedagogy competence and confidence across multiple domains following Digital Teacher Training, with substantial increases in mean scores from pre-test to post-test ($p < .001$) and moderate to large effect sizes (Cohen's d ranging from 0.430 to 1.062). These results demonstrate the intervention's efficacy in enhancing educators' proficiency in leveraging digital technologies for instruction, assessment, and student engagement, although a marginal decline was observed in facilitating student self-monitoring through digital means.

Keywords: digital pedagogy, technology integration, digital competence, educator training and student learning

INTRODUCTION

In recent times, the landscape of education has undergone a profound transformation owing to the rapid advancement of Information and Communication Technologies (ICT). This technological evolution has not only revolutionized teaching methodologies but has also underscored the imperative of integrating digital tools and skills into educational frameworks. The Organization for Economic Co-operation and Development (OECD) highlighted the pivotal role of ICT in educational curricula, emphasizing the necessity for equipping educators with the essential training to effectively utilize these tools to enhance instruction and foster student learning (OECD, 2009).

While Nigeria, like many other nations, grapples with the challenge of embedding digital competence and confidence within its teaching fraternity, a growing body of research suggests that

the prevailing focus on technical and information-related proficiencies alone falls short of furnishing educators with the holistic technology-pedagogical knowledge essential for modern educational contexts (Falloon, 2020; Guerrero, 2010; Luna Scott, 2015; Tee & Lee, 2011). This inadequacy becomes particularly evident as educators are tasked not only with nurturing digital proficiency among their students but also with harnessing the full potential of digital technologies to reimagine and elevate teaching methodologies (Ghomi & Redecker, 2019).

Addressing these challenges necessitates a deeper integration of digital fluency competencies into the training of educators in the 21st century. It is not only imperative to equip educators with a foundational understanding of digital tools, but it is equally crucial to cultivate their prowess in digital pedagogy – the art of effectively infusing technological resources into educational practices. The research conducted by Ryhtä et al. (2020) reinforces this stance, asserting that educators must possess a substantial level of expertise in digital pedagogy to effectively impart strong digital skills to the future workforce.

A paramount concern for educators at all academic tiers is the cultivation of critical and creative thinking skills among students. This aspiration, coupled with the drive to foster digital competence and harness the transformative potential of digital technologies, accentuates the necessity for educators to exhibit proficiency in technology adoption themselves (Ghomi & Redecker, 2019). Therefore, educational institutions are confronted with the imperative of developing strategies that nurture digital fluency competencies aligned with the diverse disciplinary backgrounds of educators, while preparing them for the challenges of the 21st-century classroom.

Within this context, the present study aims to shed light on the perspectives of digital pedagogy competence held by educators in Nigeria. It also seeks to gauge the impact of UNESCO MGIEP Digital Teacher training on the digital pedagogical competence and confidence of these educators. The study adopts a methodological approach involving a validated survey and paired sample t-tests to discern the differences in educators' digital pedagogical competence and confidence before and after participating in a 5-week training program from early June to mid-July 2022. The course had four quests focusing on digital resources, data protection, teaching and learning, and assessment targeting in-service and pre-service teachers, curriculum developers, and instructional designers. It consisted of weekly virtual meetings that happened at the same time as well as non-synchronous components with independent study pace for participants who have

different levels of digital literacy. Selecting and managing digital educational resources; navigating copyright laws; using digital technologies to facilitate collaborative learning; employing digital tools for student assessment and feedback are some of the important issues which were handled by this course. Prior to starting the program or after its completion participants' perceptions about this new technology were assessed in order to come up with an all-encompassing analysis on how it affected their skills in teaching through technology. This initiative by UNESCO MGIEP is a significant attempt at providing educators with the right knowledge necessary for seamlessly integrating digital technologies into their teaching plans while addressing contemporary educational needs. This program leveraged the UNESCO MGIEP digital teacher course and embraced a blend of synchronous and asynchronous modes of engagement to optimize learning outcomes. The research question guiding this study is: "Was there a change in educators' digital pedagogy competence and confidence subsequent to the implementation of Digital Teacher Training?" Through a comprehensive exploration of educators' perspectives and a rigorous analysis of their pre and post-training competence levels, this study seeks to contribute valuable insights into the efficacy of digital training initiatives and their potential to reshape pedagogical practices in Nigeria's education landscape.

This study has six sections: Section 1 provides an introduction to the research purpose. In Section 2, the theoretical framework is presented, and pertinent literature is reviewed, focusing on the assessment of educators' digital pedagogy competence and confidence in Nigeria through the lens of Digital Teacher Training. Section 3 outlines the research methodology, encompassing the study context, participants, program design, data collection tool, and analytical approach. Section 4 presents the outcomes of the data analysis. Section 5 interprets the findings, highlighting their implications for both practical applications and future research, while acknowledging limitations. Finally, Section 6 concludes the study by offering a concise summary of the research's key takeaways.

Theoretical framework and review of related literature

The DigCompEdu framework

In the realm of digital education, the DigCompEdu framework, as put forth by Redecker in 2018, emerges as a comprehensive guide that underscores the integration of technology into pedagogical practices. This framework, depicted in Figure 1, encompasses domains 2 to 5, thereby accentuating

the pivotal role of technology in fostering meaningful teaching-learning experiences. The framework provides guidelines for six major aspects of digital competence, namely: Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence. This means every aspect has different competences that teachers must possess such as effective communication and collaboration using digital technologies as well as promoting critical thinking skills among students while using digital tools.

The framework's structured approach provides a lens through which to evaluate and improve digital education practices, making it particularly relevant to the Nigerian context. It offers a structured way to examine current beliefs and practices, establishes benchmarks for best practices in digital education, and highlights the importance of enhancing digital literacy among young children. Furthermore, the framework's emphasis on professional development aligns with initiatives like the UNESCO MGIEP Digital Teacher Certification course, underscoring the need for ongoing teacher training. However, it is crucial to adapt the framework's universal principles to the Nigerian context, considering cultural beliefs and local challenges that may influence the implementation of digital education practices. By leveraging the DigCompEdu framework, researchers can identify gaps in current practices, guide improvements in digital competencies, and explore how teachers and parents can collaborate effectively to support children's digital development in Nigeria.

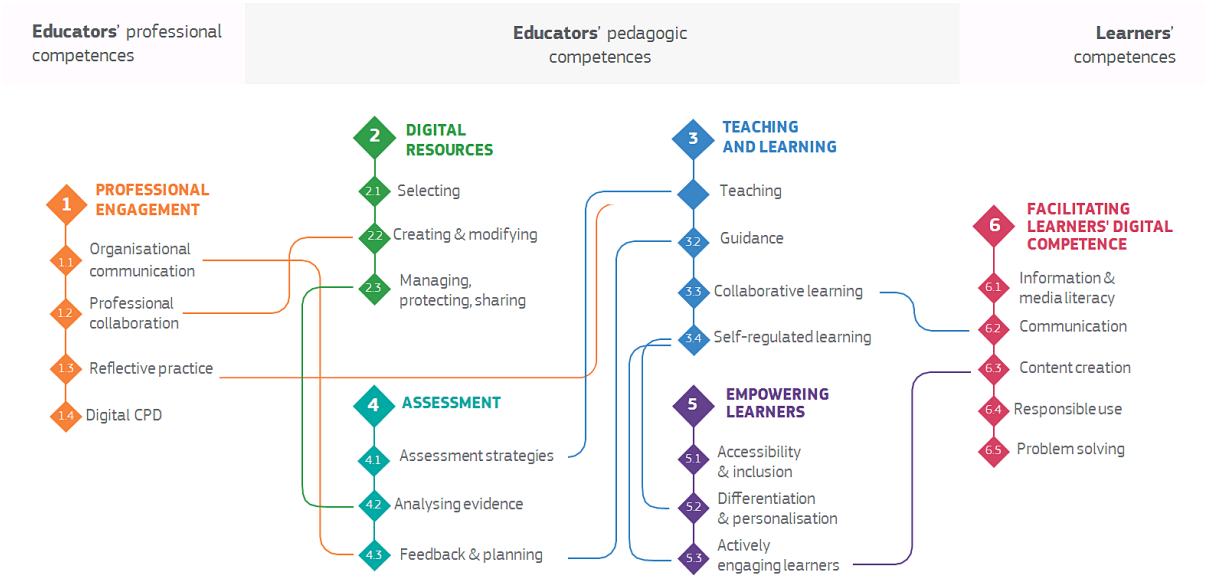

Figure 1: Overview of the DigCompEdu framework (Redecker, 2018)

The alignment between the DigCompEdu framework and the Technological Pedagogical Content Knowledge (TPACK) model proposed by Mishra and Koehler in 2006 is of particular interest. TPACK asserts that the successful integration of technology into education necessitates a harmonious synthesis of technological, pedagogical, and content knowledge. While TPACK does acknowledge certain limitations in precisely delineating the interconnections among these knowledge domains, the DigCompEdu framework supplements it by addressing specific pedagogical and professional considerations that are crucial in the integration of technology within teaching and professional practices. This synergy is further corroborated by recent research findings. Notable studies by Bilbao et al. (2021), Cabero-Almenara et al. (2022), Christine (2017), and Caena and Redecker (2019) provide additional support for the relevance and applicability of the DigCompEdu framework.

The DigCompEdu framework's primary emphasis is situated within the instructional realm, prioritizing pedagogical competencies over generic technical skills. Instead of merely emphasizing the cultivation of technical prowess, the framework underscores the imperative of addressing the pedagogical intricacies that are integral to effective teaching. It adeptly navigates the nuanced intersection of pedagogy and methodology, particularly within the context of integrating digital tools.

The DigCompEdu framework thus presents a comprehensive view of seamlessly incorporating technology into pedagogical processes. Its resonance with the TPACK model underscores its pertinence within the contemporary educational landscape, where the dynamic utilization of technology necessitates a nuanced comprehension of pedagogical and methodological dimensions. This framework serves as a valuable reservoir of insights for educators, policymakers, and researchers, offering a deeper understanding of the complexities of digital pedagogy competence and its transformative potential within the context of modern education.

Assessment of educators' digital pedagogy competence and confidence

Assessing educators' digital pedagogy competence and confidence is crucial in today's rapidly evolving technological landscape. As technology continues to play an increasingly prominent role in education, it is essential to ensure that educators possess the necessary skills and confidence to effectively integrate digital tools and resources into their teaching practices (Albion et al., 2015).

One widely recognized framework for assessing educators' digital competence and confidence is the Technological Pedagogical Content Knowledge (TPACK) framework. Developed by Mishra and Koehler (2006), TPACK emphasizes the interplay between technological knowledge, pedagogical knowledge, and content knowledge. It provides a comprehensive framework for evaluating educators' ability to integrate technology in ways that enhance learning outcomes.

To assess educators' digital pedagogy competence and confidence, researchers and educational institutions often employ a combination of self-assessment surveys, observational methods, and performance-based assessments. These tools aim to gauge educators' proficiency in using various digital tools and platforms, their ability to design and implement technology-enhanced learning experiences, and their confidence in adapting to new and emerging technologies.

Studies have shown that professional development programs focused on enhancing digital pedagogy competence can have a positive impact on educators' confidence and proficiency. For instance, a study by Ertmer et al. (2012) demonstrated that targeted professional development programs that provide educators with opportunities to engage with and reflect on technology integration practices can lead to significant improvements in their digital pedagogy competence.

In the study conducted by Albion et al. (2015), it is emphasized that educators must enhance their proficiency in digital technologies for teaching in line with the demands of the twenty-first century. The concept of digital competence, as defined by various researchers and policy makers (Spante et al., 2018), plays a crucial role in this context. Specifically, in this study, teachers' digital competence refers to their capacity to effectively utilize Information and Communication Technology (ICT) while possessing a sound pedagogical understanding and an awareness of its impact on students' learning process (Krumsvik, 2014). Krumsvik (2014) goes on to elaborate that digital competence encompasses more than just technical skills; teachers should also be capable of justifying their choices regarding the implementation of specific digital technologies in various educational settings.

There is limited research on digital competence among African educators, with notable exceptions such as the study by Danner and Pessu (2013) from Benin, Nigeria. Their research focused on examining the ICT usage habits of students in teacher preparation programs, as well as assessing the self-perceived competencies in ICT skills among these students. The findings

revealed a notable deficiency in digital competency among educators. This deficiency was attributed, in part, to the inadequate access to computers and Internet connectivity within the faculty, which posed a significant barrier to both staff and students in utilizing ICT applications effectively. Gudmundsdottir (2010) conducted research indicating that despite substantial efforts by educational authorities to enhance ICT access for both learners and teachers in public schools in Cape Town, digital equity had not been fully achieved when comparing learners' ICT competence. The report recommended a renewed policy focus that place greater emphasis on addressing the substantial inequalities that learners face within their school environment, as well as considering their home situations to a greater extent in order to bridge the digital divide and promote digital equity.

Digital Education Initiatives in Africa: A Comparative Analysis of Teacher Training Programs

There have been several digital education and teacher training interventions across Africa, including Nigeria, to improve pedagogical practices and learning outcomes. Some of the significant continent-wide programs include the African Digital Schools Initiative (ADSI) which is operational in Kenya, Tanzania, and Cote d'Ivoire (Igbatayo, 2023). This initiative aims at incorporating digital technologies into secondary schools. Another one is Microsoft’s Digital Education Transformation project that covers several countries where educators are provided with vital digital skills and resources (Shohel et al., 2022). The African Union's Continental Education Strategy for Africa (CESA) promotes ICT use to enhance educational access, quality, and relevance across member states (Union, 2015). These initiatives have collectively contributed to improved teacher capacity, increased adoption of digital tools, and enhanced learning environments.

In Nigeria, many programs have been deployed focusing on digital literacy and educational technology integration. The Teach For Nigeria Digital Literacy Initiative seeks to develop the digital capabilities of teachers as well as students from underserved communities while the National Teachers' Institute (NTI) Digital Education Program concentrates on giving comprehensive digital competencies to teachers (Aguemeka et al., 2020; Sharehu and Achor, 2014). Also of importance are UNICEF's Digital Learning Programs in Nigeria which have gone a long way towards enhancing digital learning opportunities for both teachers and students

(Azubuike, Adegboye and Quadri, 2021). These initiatives have resulted in increased digital literacy, improved teaching practices, and better integration of ICT in education across the country.

Comparative analysis of these programs provides valuable insights into the effectiveness of digital teacher training initiatives. Key aspects for comparison include changes in teacher competence and confidence, the extent of digital tool integration in teaching practices, improvements in student learning outcomes, and the sustainability and scalability of training programs. To further enrich the literature on digital education in Africa, future research should focus on conducting comparative studies between different programs, implementing longitudinal research to track long-term impacts, documenting detailed case studies and success stories, and analyzing national and regional policies on digital education. This comprehensive approach will provide a robust foundation for evaluating the success of initiatives like the UNESCO MGIEP Digital Teacher Certification course and inform future improvements in digital education across the continent.

Methodology

Research context

This study is situated in the evolving landscape of digital integration in education, amidst the rapid advancements in ICT. Recognizing the imperative of equipping educators with comprehensive digital pedagogy skills, the study addresses the specific challenges faced by Nigerian educators. The context underscores the critical need for educators to navigate digital tools adeptly, fostering critical and creative thinking skills in students. The research also aligns with global initiatives, such as the OECD's emphasis on effective technology integration for enhanced student learning. Within this context, the study evaluates the impact of a targeted UNESCO MGIEP digital teacher training course on Nigerian educators' digital pedagogy competence and confidence.

Participants

The Participants included educators in various levels of education who willingly expressed their interest in participating in the training and afterwards responded to the survey. The enrolment for these training was publicized on various professional learning networks, and it was free of charge to the participants. Those who took the survey volunteered freely and where aware there was no incentives for participation. See table 1 for reference of the demographic profile of all the participants.

Table 1. Demographic profile of the participants

Variable	Category	Frequency	Percentages
Gender	Male	134	58.8
	Female	94	41.2
Years of Experience	0 -5 years	39	17.1
	6 -10years	65	28.5
	11- 15years	61	26.8
	16 - 20years	22	9.6
	Above 20years	41	18.0
School Type	Pre-primary	6	2.6
	Primary	30	13.2
	Secondary	180	78.9
	Higher Education	12	5.3
Educational Sector	Public	68	29.8
	Private	160	70.2

Program design

A pre-and post-test design was used in the study. Using a pre-test, the participants were assessed on their perception about digital technologies. Following the implementation of a 5-week training program, a post-test was administered to evaluate whether there are changes in their perceptions based on the intervention program. The UNESCO MGIEP Digital Teacher Certification course was adopted for the training. Both synchronous and asynchronous modes of engagement was used to facilitate the training, this entailed a once a week virtual meeting with the educators and a self-paced engagement with the course on the learning platform hosted by UNESCO MGIEP for the Digital Teacher Course.

In alignment with the DigCompEdu design, the UNESCO MGIEP digital teacher course encompasses quests 1 to 4, which consist of many components. The initial quest, known as "Digital Resources," centers around the critical aspects of selecting, creating, modifying, and effectively managing digital educational resources. The second quest pertains to the safeguarding of personal data in adherence to data protection legislation, as well as adherence to copyright laws when making modifications to and disseminating digital resources. The third quest, known as "Teaching and Learning," focuses on the strategic planning, thoughtful design, and effective implementation

of digital technologies within the context of educational instruction. The primary objective of this approach is to facilitate the incorporation of digital resources and techniques in order to enhance collaborative and self-regulated learning processes. Additionally, it aims to shift the traditional teacher-led instructional model towards a learner-centered approach by providing guidance and support during these activities. Quest 4, Assessment, pertains to the practical application of digital technology in evaluating student performance and identifying their learning requirements. It involves a thorough examination of available performance data and the provision of focused and prompt feedback to learners. The framework places a central focus on the empowerment of learners, highlighting the significance of designing learning activities and experiences that cater to students' needs and enable them to actively engage in their own educational progress.

Measures for data collection

The questionnaire used for data collection was adapted from the DigCompEdu framework proficiency levels online self-assessment tool. This online self-assessment instrument was specifically designed to enable educators to evaluate their digital competence. The development of the self-assessment tool was guided by three principles. Firstly, the aim was to summarize and streamline the main concepts of the framework. Secondly, the goal was to convert competence descriptors into specific activities and practices. Lastly, the objective was to provide teachers with personalized feedback based on their individual level of competence for each of the 22 indicators. In accordance with these guiding principles, a total of 22 items were designed, ensuring that each specific competency is adequately addressed by a single item. Every item comprises of a statement that articulates the fundamental essence of the competency in specific and applicable language, along with five potential responses that are progressively organized and aligned with the degrees of proficiency. The teacher is tasked with choosing the response that most accurately represents their instructional approach.

The self-assessment tool used for this study was limited to the educators' pedagogical competencies covered in sections 2, 3, 4, and 5 of DigCompEdu framework, as illustrated in Figure 1. In addition to the aforementioned components, the instrument also encompassed inquiries pertaining to demographic characteristics and the classification of educational institutions. The educators had a pre-assessment before the training commenced where they were required to rate their perceived level of competence and confidence to use digital tools and pedagogy. The same set of self-assessment was given post the five weeks training to ascertain if there was any impact

on their perceived competence and confidence to use digital tools and pedagogies in the teaching and learning scenarios.

Data analysis

We used SPSS 25.0 to analyze the data obtained from the experiment. Participants' responses were summarized using descriptive statistics. Changes in digital pedagogy confidence and competence after training were evaluated using paired sample t-tests.

Common method bias

Self-reported, cross-sectional data were used in the study to mitigate any common method bias. The widely-recognized Harman single-factor test was utilized by the authors to evaluate this bias. The findings showed that a single-factor solution could only account for 25.123% of the variation, proving that common technique bias is not a major issue for this investigation.

Results

Validity and Reliability of the measures

The measures included in this study were carefully chosen and modified to correspond with the particular facets of competency in digital teaching. To further support the measures' content validity, existing scales and validated instruments were used whenever feasible. In addition, Cronbach's alpha coefficient was used to evaluate the internal consistency of the survey items; results over the generally recognized cutoff point of 0.70 indicated good reliability. To further support the measures' dependability, test-retest reliability was assessed to make sure responses stayed consistent across a predetermined time.

Pre and post-test results for each variables

To determine whether there were significant differences in educators’ pre-test and post-test in Educators' Digital Pedagogy Competence and Confidence subsequent to the implementation of Digital Teacher Training among experimental groups, paired sample t-tests were conducted, as shown in Table 2.

Table 2. Results of the pre and post-test in Educators' Digital Pedagogy Competence and Confidence

The use of different internet and search strategies to find and select a range of different digital resources

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.75	1.142	-1.572	-1.191	-1.39	227	-14.260	-0.944	.000
Post-test	4.14	.867							

Creating digital resources and modify existing ones to adapt them to my needs

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	3.04	1.090	-1.059	-.713	-0.89	227	-10.065	-0.667	.000
Post-test	3.93	.878							

Effectively protect sensitive materials

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	3.14	1.158	-1.163	-.793	-0.98	227	-10.410	-0.689	.000
Post-test	4.12	.872							

Carefully considering how, when and why to use digital technologies in teaching, to ensure that they are used with added value

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.92	1.077	-1.424	-1.041	-1.23	227	-12.684	-0.842	.000
Post-test	4.15	.868							

Monitor my students' activities and interactions in the collaborative online environment used

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.75	1.178	-1.397	-1.015	-1.2	227	-12.456	-0.825	.000
Post-test	3.95	.897							

Facilitate students' work in groups or teams, and their use of digital technologies to acquire and document evidence

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.78	1.183	-1.772	-.947	-1.36	227	-6.494	-0.430	.000
Post-test	4.14	2.787							

Use digital technology to allow students' plan, document and monitor their learning themselves

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.76	1.280	.021	.286	0.09	227	2.275	0.151	.000
Post-test	2.61	1.250							

Use digital assessment formats to monitor students' progress using digitals tools

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.44	1.203	-1.773	-1.385	-1.58	227	-16.039	-1.062	.000
Post-test	4.02	.863							

Analyze all data available to me to timely identify students' who need additional support

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.68	1.160	-1.455	-1.080	-1.27	227	-13.292	-0.880	.000
Post-test	3.95	.861							

Use digital technologies to provide effective feedback

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.61	1.250	-1.660	-1.243	-1.45	227	-13.732	-0.909	.000
Post-test	4.06	.866							

Considering and addressing potential digital problems when creating digital assessment for students

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.49	1.215	-1.629	-1.248	-1.44	227	-14.874	-0.985	.000
Post-test	3.93	.860							

Use of digital technologies to offer students personalized learning

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.64	1.225	-1.509	-1.131	-1.32	227	-13.771	-0.912	.000
Post-test	3.96	.844							

Use of digital technologies for students to actively participate in classes

Score	Mean	Std. Dev.	95% CI		Mdiff	df	t-value	Cohen's d	p-value
			Lower	Upper					
Pre-test	2.87	1.191	-1.420	-1.054	-1.24	227	-13.306	-0.881	.000
Post-test	4.11	.859							

Table 2 shows the significant improvements in various aspects of digital competency among the experimental group, as assessed through pre and post-tests. The scores represent the mean performance of participants, along with standard deviations, 95% confidence intervals, and other relevant statistical measures.

The first category, "The use of different internet and search strategies to find and select a range of different digital resources," saw a notable increase from a pre-test mean score of 2.75 to a post-test mean score of 4.14. Similarly, participants demonstrated enhanced skills in "Creating digital resources and modifying existing ones to adapt them to their needs," with the mean score rising from 3.04 in the pre-test to 3.93 in the post-test. The experimental group also exhibited progress in "Effectively protecting sensitive materials," as indicated by an increase in mean score

from 3.14 in the pre-test to 4.12 in the post-test. Furthermore, the participants demonstrated a significant improvement in "Carefully considering how, when, and why to use digital technologies in teaching, to ensure that they are used with added value." The mean score increased from 2.92 in the pre-test to 4.15 in the post-test. In addition, there was notable growth in the ability to "Monitor students' activities and interactions in the collaborative online environment used," with the mean score rising from 2.75 in the pre-test to 3.95 in the post-test. Participants also showed improvement in "Facilitating students' work in groups or teams, and their use of digital technologies to acquire and document evidence," with the mean score increasing from 2.78 in the pre-test to 4.14 in the post-test. In the area of "Using digital technology to allow students to plan, document, and monitor their learning themselves," the mean score showed a slight decrease from 2.76 in the pre-test to 2.61 in the post-test. However, the participants demonstrated substantial progress in "Using digital assessment formats to monitor students' progress using digital tools," as indicated by an increase in mean score from 2.44 in the pre-test to 4.02 in the post-test. Moreover, there was a significant enhancement in the ability to "Analyze all data available to timely identify students who need additional support," with the mean score rising from 2.68 in the pre-test to 3.95 in the post-test. Participants also demonstrated improvement in "Using digital technologies to provide effective feedback," with the mean score increasing from 2.61 in the pre-test to 4.06 in the post-test. Furthermore, there was a substantial growth in the competency of "Considering and addressing potential digital problems when creating digital assessments for students," with the mean score rising from 2.49 in the pre-test to 3.93 in the post-test.

Finally, there was notable progress in the ability to "Use digital technologies to offer students personalized learning" and "Use digital technologies for students to actively participate in classes," as indicated by increases in mean scores from 2.64 and 2.87 in the pre-tests to 3.96 and 4.11 in the post-tests, respectively. These results collectively demonstrate the effectiveness of the Digital Teacher Training intervention in enhancing digital competency across various dimensions.

Discussion

The results presented in Table 2 demonstrate significant improvements in various facets of digital competency among the experimental group following the intervention. These findings align with previous research emphasizing the importance of targeted training and professional development in enhancing educators' digital proficiency (Ertmer, 2005; Koehler & Mishra, 2009). The first

category, pertaining to the use of different internet and search strategies, displayed a substantial increase in mean scores from pre-test (M = 2.75) to post-test (M = 4.14). This improvement suggests that participants were able to employ more effective strategies in locating and selecting diverse digital resources. This finding is consistent with studies emphasizing the critical role of information literacy skills in the digital age (Martin & Grudziecki, 2006). Similarly, participants exhibited enhanced skills in creating and modifying digital resources to meet their specific needs. The mean score increased from 3.04 in the pre-test to 3.93 in the post-test. This improvement aligns with the notion that educators who possess the ability to adapt and create digital content are better positioned to meet the diverse learning needs of their students (Puentedura, 2006). The findings also indicate significant progress in safeguarding sensitive materials, with mean scores rising from 3.14 in the pre-test to 4.12 in the post-test. This development suggests that participants gained confidence and competence in ensuring the security of digital content, which is crucial in maintaining student privacy and confidentiality (BECTA, 2008). Moreover, participants demonstrated a substantial enhancement in their ability to judiciously consider the integration of digital technologies in teaching practices. The mean score increased from 2.92 in the pre-test to 4.15 in the post-test. This outcome aligns with the TPACK framework (Mishra & Koehler, 2006), which emphasizes the importance of pedagogical knowledge intertwined with technological knowledge in effective teaching. In addition, the observed improvement in monitoring students' activities and interactions in collaborative online environments (mean score increased from 2.75 to 3.95) highlights the potential of targeted training in fostering a more interactive and engaging learning environment (Means et al., 2013). However, it is noteworthy to mention that there was a slight decrease in the mean score for using digital technology to allow students to plan, document, and monitor their learning themselves (from 2.76 to 2.61). This could be attributed to various factors, including individual comfort levels with student autonomy and self-directed learning, and may warrant further investigation.

Overall, the substantial improvements in various dimensions of digital competency among the experimental group underscore the effectiveness of the intervention in equipping educators with the skills and knowledge necessary for effective digital integration in education.

Limitation and future research

While the findings of this study are promising, it is important to acknowledge several limitations. Firstly, the study's sample size was limited to a specific group of educators, which may affect the

generalizability of the results to a broader population. Future research could consider a more diverse and representative sample to ensure broader applicability. Secondly, the study relied on self-reported measures of digital competency, which may introduce response bias. Incorporating objective measures or performance-based assessments could provide a more comprehensive understanding of participants' actual proficiency levels. Additionally, the study design did not include a control group, which makes it challenging to attribute the observed improvements solely to the intervention. Including a control group would help to better establish a causal relationship between the intervention and the observed outcomes.

To build on the current study, future research could explore several avenues for further investigation. Firstly, conducting a longitudinal study to track the long-term impact of the intervention on educators' digital competency would provide valuable insights into the sustainability of the effects over time. Moreover, it would be beneficial to investigate specific instructional strategies and pedagogical approaches that are most effective in enhancing digital competency. This could involve examining the role of mentorship, peer collaboration, and ongoing professional development in supporting educators' continued growth in digital proficiency. Furthermore, exploring the impact of enhanced digital competency on student outcomes, such as engagement, achievement, and digital literacy, would offer a more comprehensive understanding of the broader educational benefits. Additionally, future research could delve into the specific challenges and barriers that educators may face in their efforts to integrate digital technologies effectively. Understanding these challenges would inform the development of targeted interventions and support mechanisms. Finally, given the rapid evolution of technology, it would be valuable to conduct similar studies in the future to assess the adaptability and effectiveness of interventions in response to emerging digital tools and platforms. In conclusion, while this study provides valuable insights into the effectiveness of the intervention in improving educators' digital competency, there are areas for further exploration and refinement. By addressing the identified limitations and pursuing avenues for future research, we can continue to advance our understanding of how to best prepare educators for the evolving digital landscape in education.

Conclusions

In conclusion, this study highlights the significant impact of a targeted intervention on enhancing educators' digital competency across various dimensions. The findings underscore the importance

of providing educators with tailored training and professional development opportunities to effectively integrate digital technologies into their teaching practices. The observed improvements in areas such as information literacy, content creation, and pedagogical integration of technology demonstrate the potential for meaningful growth in digital proficiency. These enhanced skills have the potential to empower educators to create more engaging, interactive, and personalized learning experiences for their students. However, it is crucial to acknowledge the limitations of this study, including the sample size, reliance on self-reported measures, and absence of a control group. Future research should address these limitations and explore additional avenues for investigation, such as longitudinal studies, in-depth exploration of instructional strategies, and assessments of the impact on student outcomes. Overall, this study contributes to the growing body of literature on digital competency in education and provides valuable insights for educators, administrators, and policymakers seeking to support and empower educators in their efforts to leverage technology for enhanced learning experiences. As technology continues to evolve, ongoing research and professional development initiatives will be essential in ensuring that educators remain well-equipped to navigate the digital landscape and effectively prepare students for success in the digital age.

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