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Empowering teachers: The role of digital technology in professional competency development in Saudi Arabia

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ABSTRACT

This study explores how digital technology enhances the professional capabilities of teachers in Saudi Arabia. A sample of 300 male and female teachers across intermediate and secondary schools is present in Al-Ahsa Governorate. The evaluation utilized a questionnaire and the teacher professional competence scale to measure digital technology's impact on teacher professional development across the kingdom. The study revealed the status of teacher's digital technology usage in education and its role in developing their professional competence. A research gap was identified, emphasizing the need for targeted interventions to bridge the divide between awareness of digital resources and their effective implementation to enhance teaching quality. Multiple regression analysis showed a strong relationship between teacher competencies and digital technology components ($p = 0.001$). Proper utilization of digital tools can significantly enhance teacher competence. The findings provide valuable insights for designing training programs that improve teachers' ability to use digital technology effectively. Educational institutions can empower teachers, improve teaching quality and align with Saudi Vision 2030 goals by addressing existing barriers and promoting comprehensive professional development initiatives. Schools should initiate programs that include carefully planned workshops combined with collaborative learning opportunities with continuous technical assistance mechanisms to teach teachers how to master digital tools.

Contribution/Originality: The study investigates how digital technology improves teaching expertise for Al-Ahsa, Saudi Arabia, teachers through classroom technology evaluations. This research fills an existing practical need by establishing methods to enhance classroom quality. The research relies on a competence scale and questionnaire to obtain data that will guide training interventions focused on Saudi Vision 2030 objectives.

1. INTRODUCTION

Continuing professional development for teachers has been an important necessity to promote efficiency and quality of education delivery. It covers ongoing learning activities that enable teachers to develop the competencies to enhance teaching and learning. Teacher training opportunities help to improve the performance of teachers and improve students' results due to the availability of methods and approaches based on modern concepts that increase the efficiency of the educational process (Nasution, Madhakomala, Rugaiyah, & Dany, 2024). Moreover, provision and participation in continuous professional development support teachers in embracing improvements as well as changes in the curriculum and diffusion of the fast-growing technological field (Ybnu, Dewi, Mere, & Sakti, 2024). Introducing technologies in the program as well as

creating appropriate environments are the key factors driving the success of such programs (Rodymenko, Bazylevska, & Garnyuk, 2023). Moreover, principles like continuity, diversification, and communicative partnership contribute to the improvement of teachers' regulatory activity, which in turn contributes to the sustainability of educational developments (Tovkanets, 2022).

The advancement of technology has yielded teachers greater learning and professional development opportunities where they do not need time and space (Kao, Tsai, & Shih, 2014). Employing technology to support teachers' professional development creates affinity spaces that are different from the conventional settings limited by bureaucracies and hierarchies (Zhang, 2022). Technology has many benefits. Education becomes interesting and more efficient concerning enhancements. Students participate and learn according to their interests in what they prefer most. Technology addresses the student's affective learning modality, specifically the audiovisual feeling domain (Baroroh, Kusumastuti, & Kamal, 2024; Kate et al., 2024).

Technology has become an inseparable part of people's daily lives (Aghaei, Rajabi, Lie, & Ajam, 2020). Therefore, it comes back to the question of how to reconsider the ideas of incorporating technology into the educational process and concentrate on how it can facilitate the learning process. In other words, technology becomes part of the content learnt and pertains to education and teachers from the preparation of the learning environment (Altun & Khurshid Ahmad, 2021). Teachers are regarded as the main actors in the use of technology within classes every day that by virtue of its effectiveness in portraying a lively and proactive education-learning environment concerning the preparation of the learners for the present digital technology (Arnseth & Hatlevik, 2010). Although technology merging's goal is to improve and develop the quality, availability, and affordability of teaching learners, it also describes the role of networking groups of learning to address the challenge of modern globalization complex environments (Yunus, 2007). Its adoption method is not linear (Lee & James, 2018). Important roles identified for technology include enhancing tasks for students and technology has a great effect on teacher's teaching. If teachers do not incorporate these technologies into their education, they will be left behind when it comes to such approaches (Zhang, 2022).

1.1. Professional Development, Professional Training and Development Programs

The studies by Nasution et al. (2024); Marcelo-Martínez, Yot-Domínguez, and Marcelo (2023); AbdulRab (2023) and Loughran and Hamilton (2016) suggest that intense professional development before and after school practice makes a huge contribution to the improvement of the teachers' effectiveness and the effectiveness of students' outcomes, pointing to the necessity of providing further support and cooperation to all the partners. These events help to improve the teaching competencies of teachers, thus helping them to implement their teaching methodologies. Moreover, the sharing of experience among tutors helps the development of a socially constructive environment that will contribute to the personal growth of the professional (Nasution et al., 2024).

Educational training functions as an integral factor that drives in-service teacher practitioner development at the same level as it enhances novice instructor development. The foundation of this practice enables teachers to develop adaptability with improved pedagogical methods to tackle the multiple complexities in current educational systems. Professional development as a continuous practice also known as Continuous Professional Development (CPD) serves as both a legal requirement and educational transformation process that benefit teaching professionals and the total educational community. The ongoing training system enables teachers to create personalized teaching methods that accommodate diverse student needs specifically when working with inclusive student populations (Cruz et al., 2024). The engagement with continuous professional development helps teachers boost their core competencies that specifically improve classroom management alongside technological integration thus leading to better student results (Sadiq, Fatima, Shah, & Soomro, 2024). The continuous development of teachers depends on the essential

collaboration between teaching professionals because it enhances their ability to provide effective support. Educational partnerships enable teachers to adopt new educational methods effectively in their practice rooms to maximize the results of their professional training (Cruz et al., 2024).

1.2. Integration of Technology in Professional Development

The fast growth of digital technology has delivered a profound transformation to professional development practices for educational and other professional fields. Traditional professional development methods through workshops and seminars receive increasing digitization alongside platform and tool integration (Napitupulu, Muddin, Bagiya, Diana, & Rosyidah, 2024; Vigel & Mettini, 2024). Digital technology has emerged as a necessary response to create flexible learning platforms which provide individualized opportunities while maintaining accessibility (Akimova, Sapohov, Hapchuk, & Sali, 2024; Joseph, Onwuzulike, & Shitu, 2024).

Integration of digital technology within teacher professional development (TPD) now transforms how teachers receive their skill and knowledge advancement (Joseph et al., 2024). Through digital tools like online courses and webinars alongside virtual communities' teachers can practice collaboration and reflection which drives both improved teaching quality and student success (Subasman, 2024). Digital competencies represent a crucial requirement for contemporary educational practices so they drive the ongoing transformation of the sector. Studies demonstrate that digital educational practices create advanced digital competencies in teachers which produce better training results (Joseph et al., 2024; Vigel & Mettini, 2024). The combination of online and blended learning methods shows significant benefits for developing teacher competencies as well as boosting self-efficacy and student achievement rates (Stavermann, 2025). Professional learning communities (PLCs) function as essential tools for digital professional development by encouraging teacher collaboration which bolsters its results (Liu, Aziku, Qiang, & Zhang, 2024). Teachers who routinely participate in professional learning communities achieve better alignment of digital technology with their instructional delivery which leads to enhanced learning environments (Liu et al., 2024). Digital technology emerges as a transformative instrument for TPD that facilitates ongoing professional enhancement and enhances academic results (Napitupulu et al., 2024).

The adoption of digital technology for teacher development faces difficulties that need immediate solutions to establish proper conditions for enhancing technology usage in educational environments. Three main obstacles block digital tools from properly being used by teachers in teaching and learning: digital literacy gaps and resistance behavior with unequal access to technology systems. The insufficient digital literacy skills among teachers create obstacles to their successful adoption of technological teaching methods (Napitupulu et al., 2024). Professional development programs need to invest in training that combines technology proficiency with teaching strategies to equip teachers to properly utilize digital tools in their classrooms (Theodorio, 2024). Both educational staff members tend to show negative reactions to change and resist implementing new technologies, as well as sticking to traditional teaching methods (Ranbir, 2024). Professional learning communities help minimize this resistance by encouraging educators to develop mutual support networks and learn from each other while receiving encouragement from their peers (Napitupulu et al., 2024). Unequal access to technology poses a dominant challenge to vocational institutions because it intensifies preexisting educational disparities (Kossova-Silina, 2024). Educational institutions must invest in better infrastructure and equal opportunities to digital resources to let every teacher take advantage of technological integration (Ansari, Waris, & Zara, 2024).

1.3. Positive Attitudes toward Digital Media as a Component of Teachers' Professional Identity

The Theory of Planned Behavior (TPB) demonstrates strong effectiveness in predicting behavioral intentions across various fields, including education and health research. According to teaching research, teachers' attitudes regarding digital media usage show a significant influence over their adoption intentions, surpassing the effects resulting from self-efficacy. Teachers develop their media attitudes based on the perceived impact of digital tools on student education and their personal growth (Aumann, Grassinger, & Weitzel, 2024). Multiple studies confirm that teachers who display favorable attitudes toward educational technology demonstrate a stronger intent to use such educational tools regularly in their classrooms (Gold, Thomm, & Bauer, 2024). Research indicates that educational technology adoption relies more heavily on attitudes than on self-efficacy measures in teaching environments (Gold et al., 2024; Prasetya, Darmayanti, & Setyorini, 2024). According to research findings, the influence of subjective norms on teachers' intentions remains less significant compared to their psychological attitudes (Dodaj, Sesar, Bošnjak, & Vučić, 2024; Wafiroh & Wuryaningsih, 2024). External influences apply to a lesser extent than what teachers genuinely feel about technology's value. The close relationship between perceived behavioral control and self-efficacy determines how teachers develop their intentions toward using digital media. The combination of motivation levels and effective educational technology deployment in instructional practices depends heavily on this particular factor (Gold et al., 2024; Prasetya et al., 2024). Technology use control influences pre-service teacher teaching behaviors, especially when seeking teacher education (Dodaj et al., 2024).

The findings highlight a critical issue in the integration of digital technology into education while teachers possess the professional knowledge and potential to enhance student learning experiences and outcomes, this potential is often hindered when their capacity for deep, critical reflection remains underdeveloped. This limitation becomes particularly evident when educational innovation is not embedded within a broader ecosystem of teacher professional development (TPD). Teachers may struggle to effectively design, implement, and assess student learning in the context of digital technology. The twofold approach presented in this study provides a unique lens to analyze this issue. It examines how teachers perceive their professional development in relation to digital technology whether as an opportunity to genuinely improve and expand their skill set or as a process that merely substitutes their expertise with technological solutions. This distinction is crucial as it reveals the need for TPD programs to move beyond technical training and focus on cultivating teachers' ability to critically reflect on their practices, adapt to new challenges and innovate in meaningful ways. The problem lies in the gap between the potential of digital technology to transform education and the current limitations in teachers' professional development. The full benefits of digital tools may remain unrealized, ultimately limiting their impact on student learning outcomes without a focus on deep, critical reflection and the integration of innovation into a holistic TPD ecosystem. Addressing this gap is essential for ensuring that teachers are not only equipped with technical skills but also empowered to use technology as a tool for meaningful educational innovation.

1.4. Research Objectives

The study aimed to identify how digital technology improves the professional abilities of teachers across Saudi Arabia.

1.5. Research Questions

The research questions that guided this study were as follows:

1. What is the current status of integrating digital technology into teacher professional development programs in Saudi Arabia?
2. What is the reality of teachers' professional competence development in schools?

3. How has digital technology affected the teachers' professional competence development in schools?

2. MATERIALS AND METHODS

A quantitative explanatory approach served as the research methodology to explore how digital technology affects the enhancement of teacher competencies. The study participants consisted of 300 men and women teachers, and the study population was chosen based on Thomson's (2012) sampling method. An electronic questionnaire was built with five axes based on statements for hardware, software, databases, networks, and human resources followed by an 18-statement scale to measure teacher competence rated on a five-point Likert scale. The Ethical Committee of King Faisal University, Saudi Arabia approved this study on 23 MAR 2024 (Ref. No. KFU-2024-MAR-ETHICS2288).

2.1. Participants

The study involved 1344 teachers, including male and female educational teachers from the governmental educational sector in Al-Ahsa Governorate within the Eastern region of Saudi Arabia, who practiced the educational process during the second half of the academic year 2023-2024. The researchers validated the questionnaire through validity and reliability by selecting 50 male and female teachers for the survey. The basic research sample included 300 randomly selected male and female teachers who taught at different intermediate and secondary schools in Al-Ahsa Governorate and the researcher determined the sample size (Thompson, 2012). The researchers commenced their study during the early part of the second academic semester in 2024 and provided detailed explanations about the research community variables in Table 1 and Figure 1.

$$n = \frac{N \times p(1-p)}{[[(N-1) \times (d^2 \div z^2)] + p(1-p)]}$$

n: sample size; N: community size; z: confidence level at 95% (1.96); d: error rate (0.05); p: percentage (50%).

Table 1. Research sample description according to demographic information.

Demographic variables		Sample	Number	Percentage (%)
Gender	Male	300	147	49
	Female		153	51
Age	Under 25	300	62	20.67
	26-35		95	31.67
	36-45		92	30.67
	Over 45		51	17.00
Educational qualification	Bachelor's degree	300	222	74.00
	Master's degree		15	5.00
	PhD		12	4.00
	Other		51	17.00
Teaching experience	Less than 5 years	300	92	30.67
	5-10 years		91	30.33
	11-15 years		88	29.33
	More than 15 years		29	9.67
Subject taught	Science	300	49	16.33
	Mathematics		42	14.00
	Arabic		61	20.33
	English		51	17.00
	Social studies		52	17.33
	Other		45	15.00

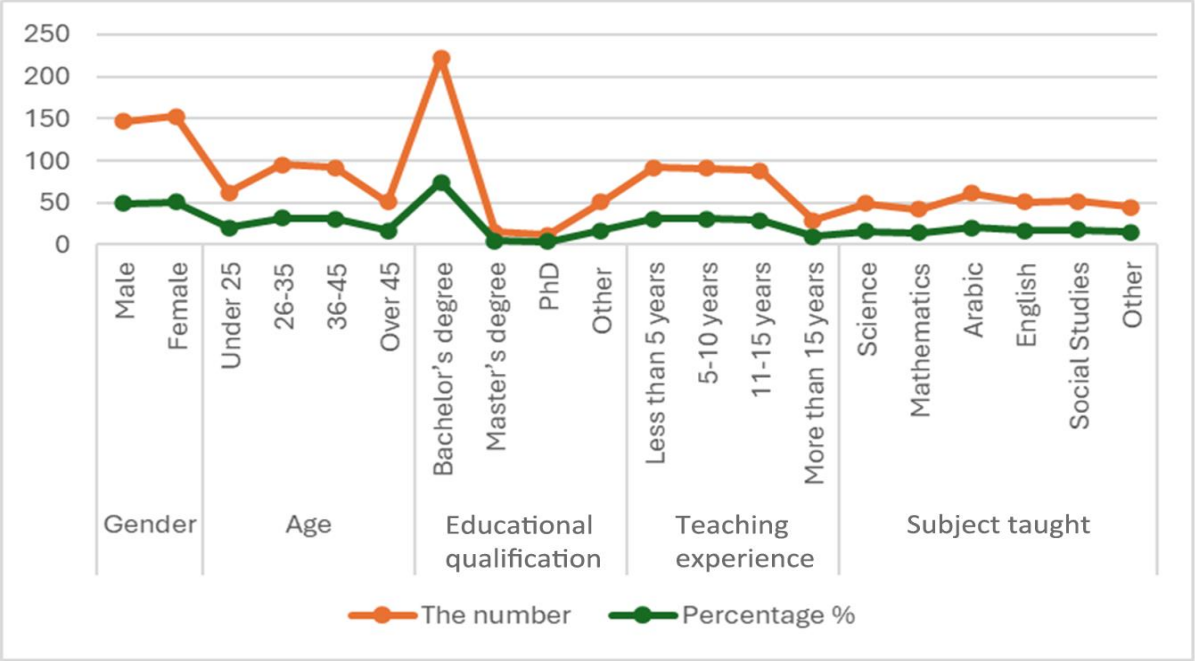

Figure 1. The participant numbers and percentage breakdowns concerning demographics.

2.2. Instrument

A research questionnaire served as the study instrument which evaluated the digital technology impact on teacher professional capability enhancement throughout Saudi Arabia (Lareki, Altuna, de Morentin, & Amenabar, 2017; Montero-Mesa, Fraga-Varela, Vila-Couñago, & Rodríguez-Groba, 2023). Five experts reviewed the tool while Cronbach's alpha calculated reliability levels and exploration factor analysis was performed (Lareki, de Morentin, Altuna, & Amenabar, 2017). There were 25 items in the questionnaire (digital technology) arranged into five axes: hardware (5), software (5), databases (5), networks (5), and human resources (5) (see Appendix A). We also used the teacher professional competence scale, which contained 18 items (see Appendix B). All survey questions used a five-point Likert scale which ranged from strongly does not apply (1) to strongly applies (5). The researchers applied Pearson's correlation coefficient to assess questionnaire internal consistency while the correlation coefficient values for the first axis spanned (0.662-0.821) and the second axis (0.801-0.884) with the third axis (0.786-0.893) and the fourth axis (0.664-0.802), and the fifth axis (0.676-0.798). Researchers determined the values of correlation coefficients between each axis and the total questionnaire score to be (0.811 - 0.815 - 0.722 - 0.841 - 0.764). The correlation coefficient for the teachers' professional competence scale was 0.842. The analysis found statistical significance at $P < 0.01$ for all variables, which proves that both subtests and total questionnaire scales have strong internal consistency with their dimensions.

Table 2 verifies questionnaire stability by using Cronbach's alpha coefficients in the research (see Table 2). The questionnaires demonstrated excellent stability through their coefficient of stability rate between 0.794 and 0.901. Table 2 shows the stability of the questionnaires.

Table 2. The reliability of the digital technology and teachers' professional competence questionnaires for teachers.

Section of the questionnaire	Alpha coefficient (α)
First axis	0.815
Second axis	0.882
Third axis	0.901
Fourth axis	0.794
Fifth axis	0.853
Teachers' professional competence scale	0.881

2.3. Questionnaire Distribution

The researcher designed the questionnaires with Google Drive tools. The Education Department of Al-Ahsa collaborated to identify proper distribution methods. The researchers presented the questionnaires officially after explaining their importance and received authorization to distribute them among teachers. The education department received precise instructions about distribution procedures which outlined the schedule while highlighting increased participation demand from teachers. The Education Department of Al-Ahsa forwarded electronic questionnaire links to each connected school under instruction to deliver the links directly to teaching staff. The official school communication system served as the distribution method to ensure all teachers received the questionnaire even when they were based in branches or remote locations. The questionnaire was launched during the initial part of the second academic semester in 2023-2024 to allow teachers enough time for completion before their complete immersion in regular academic duties. The survey used motivational incentives, which included pointing out how results would help develop training programs for teachers alongside bettering the educational environment. Response collection occurred directly through Google Drive, which automatically stored data into an accessible electronic table for analysis purposes. The study period for questionnaire distribution spanned from March 5 to March 27, 2024.

2.4. Data Analysis

An assessment of the quantitative survey data utilized Statistical Package for the Social Sciences (SPSS) version 26 for analysis. The researchers utilized mean, standard deviation, percentages, chi-square, and Cronbach's alpha together with multiple regression analysis to execute comprehensive descriptive data analysis. The analysis performed on SPSS 26 statistical social science software by IBM Corporation strengthened the credibility of the findings since the platform maintains strong recognition within the field. The research-maintained reliability by designating $p < 0.05$ as the threshold statistical significance level enhanced both data threads and research reliability.

3. RESULTS

Quantitative findings are discussed and interpreted in relation to the research questions.

Research Question 1: What is the current status of integrating digital technology into teacher professional development programs in Saudi Arabia?

The participant teachers' digital technology awareness appeared low based on Table 3 results which demonstrated a 2.6 (SD = 1.00) average and 51.20% response rate.

Table 3. Respondents' opinions in the questionnaire on the reality of digital technology in schools.

Phrase	Mean	Std. deviation	Response percentage (%)	Chi-square	Sig.
Axis one: Hardware	1.6	1.1	32.67	434.8	0.00
1.	1.8	1.1	35.33	316.6	0.00
2.	2.4	1.1	47.13	103.5	0.00
3.	2.3	1.1	46.80	138.5	0.00
4.	2.6	1.0	51.20	112.4	0.00
5.	2.1	0.7	42.63	242.3	0.00
Total axis	1.7	0.9	34.93	143.5	0.00
Axis two: Software	1.6	0.8	31.20	308.7	0.00
6.	2.4	1.0	47.60	154.3	0.00
7.	1.6	0.6	32.53	235.8	0.00
8.	2.3	0.9	45.87	216.3	0.00
9.	1.9	0.6	38.43	177.5	0.00
10.	1.5	0.8	30.93	109.8	0.00
Total axis	2.0	0.9	39.00	6.5	0.04

Phrase	Mean	Std. deviation	Response percentage (%)	Chi-square	Sig.
Axis three: Databases	1.7	0.8	34.40	160.9	0.00
11.	1.9	0.9	37.60	132.8	0.00
12.	1.5	0.8	30.53	310.2	0.00
13.	1.7	0.8	34.49	464.2	0.00
14.	2.2	1.2	44.40	181.4	0.00
15.	1.4	0.7	28.53	353.4	0.00
Total axis	1.9	0.9	38.73	9.7	0.01
Axis four: Networks	2.2	1.2	44.80	149.2	0.00
16.	2.0	0.8	39.00	2.9	0.23
17.	2.0	0.9	39.09	429.6	0.00
18.	1.6	0.8	31.53	152.1	0.00
19.	1.5	0.8	29.87	162.6	0.00
20.	2.0	0.8	40.87	1.6	0.45
Total axis	2.2	0.9	44.80	79.9	0.00
Axis five: Human resources	2.1	0.9	41.61	13.6	0.00
21.	1.9	0.7	37.73	255.1	0.00
22.	1.9	0.7	38.47	132.8	0.00
23.	1.6	1.1	32.67	434.8	0.00
24.	1.8	1.1	35.33	316.6	0.00
25.	2.4	1.1	47.13	103.5	0.00
Total axis	2.3	1.1	46.80	138.5	0.00
Total questionnaire	2.6	1.0	51.20	112.4	0.00

The KMO values for the reality of the digital technology questionnaire (hardware, software, databases, networks and human resources) reached 0.566, 0.701, 0.841, 0.816 and 0.760 respectively. The KMO value for the full questionnaire was 0.936 while the Bartlett test of sphericity results showed statistical significance (P = 0.001). The responses did not show variance which could be attributed to random factors.

Research Question 2: What is the reality of teachers' professional competence development in schools?

Teachers scored various items on the professional competence questionnaire low throughout (from 1.15 to 2.72 on the Likert scale) indicating that most participants held disagreeing views or neutrality toward the statements. The survey participants gave their highest agreement rating to create a safe learning environment with support (2.72) but showed the least agreement to technology implementation in teaching (1.15) and value promotion for students (1.16). The standard deviation measures response diversity among teachers when they evaluated flexibility in handling challenges (item 12) since this question produced a non-significant p-value (sig. = 0.96). Teachers demonstrate higher levels of confidence when developing supportive classrooms than when employing technology or instilling values in their students (see Table 4).

Table 4. Respondents' opinions in the questionnaire on the teachers' professional competence in schools.

Phrases	Mean	Std. deviation	Response percentage (%)	Chi-square	Sig.
1.	1.90	1.17	38	222.20	0.00
2.	1.89	1.07	38	221.77	0.00
3.	2.42	1.04	48	137.83	0.00
4.	2.32	1.00	46	197.17	0.00
5.	2.72	0.92	54	186.00	0.00
6.	1.87	0.84	37	132.99	0.00
7.	1.90	0.96	38	206.64	0.00
8.	2.38	1.01	48	154.27	0.00
9.	1.63	0.62	33	235.79	0.00
10.	2.29	0.88	46	214.37	0.00
11.	1.64	0.82	33	187.87	0.00
12.	2.01	0.82	40	0.08	0.96
13.	1.81	0.84	36	128.29	0.00

Phrases	Mean	Std. deviation	Response percentage (%)	Chi-square	Sig.
14.	1.94	0.88	39	105.15	0.00
15.	1.16	0.50	23	423.38	0.00
16.	1.15	0.47	23	418.58	0.00
17.	1.64	0.79	33	68.46	0.00
18.	1.66	0.87	33	106.02	0.00
Total questionnaire	1.91	0.52	38	91.53	0.00

The KMO values established for the teachers' professional competence questionnaire amounted to 0.856 following statistical interpretation from Bartlett's test of sphericity (P = 0.001). The responses did not show variance, which could be attributed to random factors.

The results of the multiple regression analysis appear in Figure 2. An assessment plot reveals data points that follow a straight line orientation, thus showing the distribution of residuals follows normal distribution leading to normal data distribution.

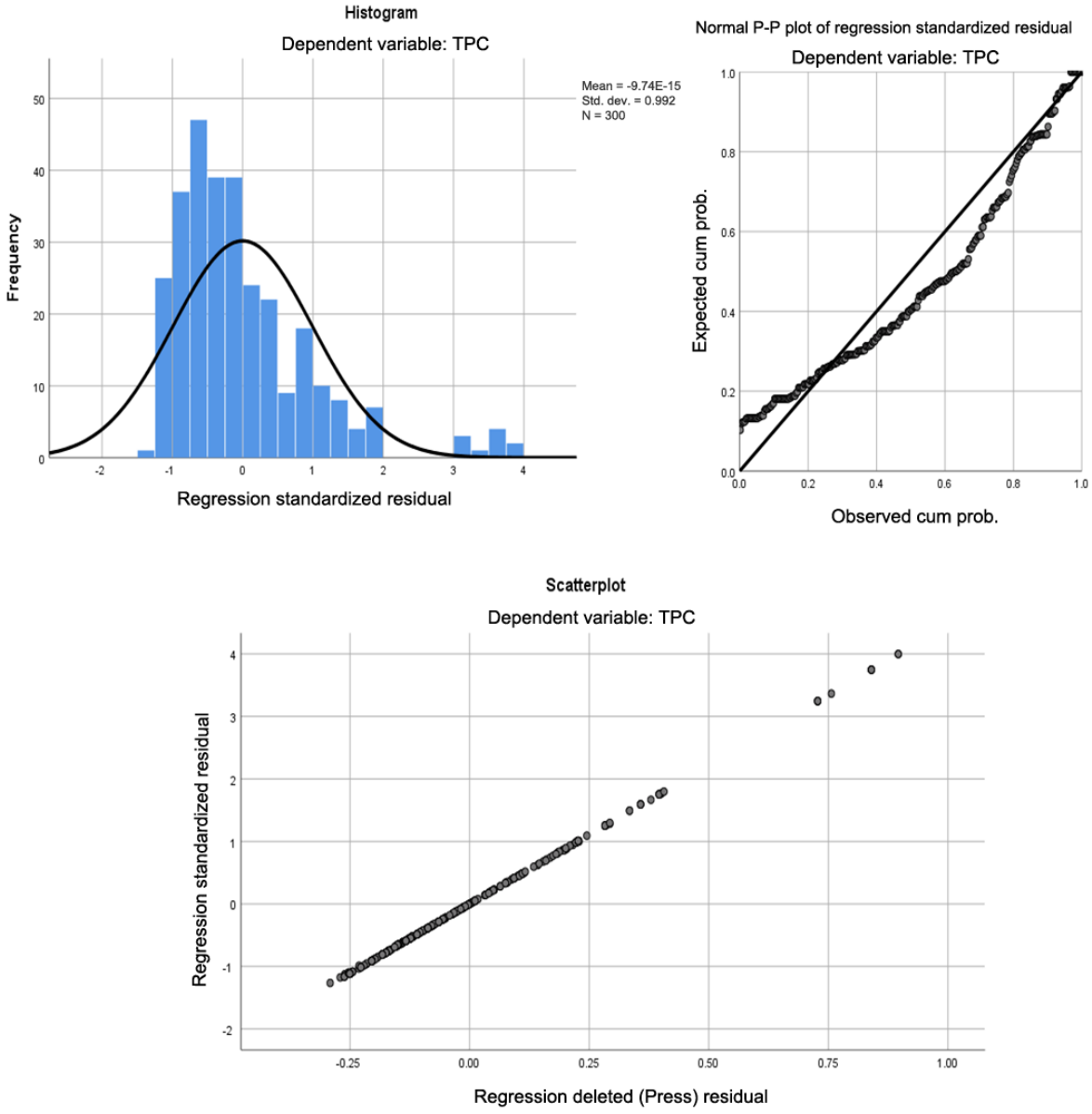

Figure 2. Multiple regression analysis.

Table 5. Regression results.

R- square	**0.823**
F –value	273.697
Significance	0.001
Beta of hardware	0.143
Beta of software	0.176
Beta of databases	0.447
Beta of networks	8.520
Beta of human resources	0.020

The research establishes how digital technological components (hardware, software, databases, and human resources) relate to teacher professional competence. The study utilized a multiple linear regression model that evaluated digital technology (hardware, software, databases, and human resources) as independent factors relating to teachers' professional competence (see Table 5). A statistical test confirmed that the regression model possesses significance (F) p = 0.001. The applied model proves valid because it demonstrates a relationship between teachers' professional competence progression through digital technology implementation. The results demonstrate that the explanatory variables explain 0.0.823 of the future trends in teachers' professional competence by examining the r2 value which shows the relationship between professional competence and digital technology. The relationship between teachers' professional competence's future and digital technology elements (hardware, software, and databases) exists at the significant level of p = 0.003, yet networks and human resources show no such relationship. The test results produced a value of p = 0.333; 0.671 that exceeded the predefined significance threshold (0.05). We can also write the regression equation as follows: future professional competence = 0.20 + (0.0.143 * hardware) + (0.176 * software) + (0.447 * databases) + error term.

4. DISCUSSION

The basic aim of this research is to explore the relationship between technology-based education and teacher professional development to examine the role of teachers in the innovation process and the impact of digital innovation on their teaching practice. This study indicates Saudi Arabia has made advances with digital technology in their teacher professional development programs, yet many important obstacles persist. The ineffective use of digital tools by teachers stems from hardware limitations combined with software underutilization, database neglect, network unreliability, and the shortage of human resource support. The implementation of targeted interventions will build teachers' digital competencies while advancing the digital and educational objectives of Saudi Arabia's Vision 2030 plan. The implementation of technology in Saudi educational institutions faces important obstacles due to insufficient equipment resources and deficient repair functions and insufficient teaching staff training. Current obstacles restrict proper use of digital tools at educational institutions thus limiting opportunities that come from technology-based teaching approaches. The investment in ICT has been unsuccessful because Saudi schools lack modern devices and technical support alongside an insufficient training program. The research by Alharbi, Alshabeb, Alshammari, and Almaqrn (2020) shows that numerous Saudi Arabian schools do not have modern educational devices such as interactive whiteboards, tablets and laptops which serve as required tools for implementing digital teaching resources in classrooms. Access to devices does not ensure proper maintenance and technical support because the current resources predictably break down and stay unused (Alenezi, 2019). Educational software training deficiencies among teachers cause them to experience discomfort when trying to utilize sophisticated software functionalities. According to Alenezi (2019) continued support and practical experience enable teachers to achieve maximum software potential. The acknowledging benefits of educational technology have become more prominent despite the substantial difficulties teachers face when using it. According to Hameed (2024)

teachers express positive attitudes and students show enthusiasm for digital solutions in educational spaces when schools establish proper infrastructure with supporting systems in place.

The study shows that teachers exhibit considerable dissimilarities in their evaluation of professional development because specific items from the professional competence questionnaire yielded low scores. The results show that teachers might lack enough proficiency or self-assurance when it comes to specific aspects of their work. The research indicates teachers show strong agreement about establishing safe learning environments because they make classroom safety a priority. The need for complete professional development becomes evident because teachers require support to build competence in all areas. Professional development sessions receive unsatisfactory ratings from teachers because they are considered unessential and offer insufficient time for practical implementation (Sanchez, Williams, & Ferrara, 2018). The research conducted by Suryandari, Rokhmaniyah, and Wahyudi (2024) reveals an important deficit in high-quality supports and resources needed to implement effective teaching and learning methods while teachers tell Milenković, Maksimović, Dimitrijević, and Damjanović (2024) that they need additional help to carry out inclusive education and doubt the quality of their current professional seminars. Teaching professionals make safety and support their first priority above all else because they recognize how essential these factors are to achieve good teaching results (Channa et al., 2025). The broader objective of building supportive learning situations that enhance student engagement matches this specific emphasis (Nasution et al., 2024).

Several reform areas become evident because education professionals still lack agreement about technology use in classes and its benefits for students. Educational professionals regularly experience obstacles when implementing technology-based instruction because their levels of comfort and background knowledge in this field differ from person to person. Numerous responses about flexibility in managing challenges shows widely different approaches to confronting difficulties in the classroom. This article examines crucial elements associated with this problem. Artificial barriers exist because most teachers lack sufficient experience with new technologies for effective instructional delivery. Student internet access remains sparse. Teachers receive inadequate education while facing this situation (Ningsih, 2024; Park, 2023). The technological integration process becomes more difficult because of insufficient infrastructure alongside inconsistent economic access to technology among students (Ningsih, 2024). Technology provides opportunities to boost student involvement alongside creative development and supports team-based education. Digital devices serve as effective tools for teachers because they enhance the educational experience by making it livelier and more exciting (Ningsih, 2024). Digital skill development for students creates a great advantage because it prepares them to handle technological innovations that lie ahead (Ningsih, 2024). The integration of technology in education requires teachers to possess strong TPACK competencies because it helps them achieve higher self-efficacy and reduces their stress with technology usage (Al-Adwan et al., 2024). The way students perceive ease of use and their satisfaction with educational technology depends highly on their cultural influences (Tusha et al., 2024).

A strong relationship exists between digital technology components, including hardware and software and databases, and teacher professional competence based on the multiple regression analysis results. The beta coefficients establish the separate impact of digital technology components on teacher professional competence. According to the study findings, each digital technology element contributes independently to professional competence. The research implies that dedicating resources to hardware and software development alongside database administration can enhance teacher professional competence standards. The analysis establishes a significant relationship between digital technology elements and teaching professional capability. The study demonstrates how hardware, software, and databases function independently while fostering interconnections that improve the professional capabilities of teachers. According to Fatimah, Manik, Nadeak, and Yunita (2024) teachers need modern tools of hardware and software to seamlessly include

technology within their instructional approach, which develops their subject-specific capabilities. Continuous professional development with an emphasis on building digital competencies stands vital for preparing teachers to navigate rapidly evolving educational technology because it permits them to slowly adapt their practice (Camarillo, 2024). The use of digital didactics, including gamification and cloud-based technologies, successfully generates interactive interfaces that capture student interest in the learning process. Educational approaches that engage students effectively help teachers maintain necessary professional competencies for current and future teachers (Raimkulova & Sarybaeva, 2024). Digital learning environments with motivation principles and adaptability mechanisms promote new technology adoption among teachers to establish a culture of continuous learning as well as professional development (Zaripov, Zaripov, & Symonenko, 2024).

The implementation of digital technology in education meets barriers from employee resistance to change as well as inadequate training programs. Teachers face resistance mainly because their previous unpleasant experiences combined with their lack of familiarity with digital tools and inadequate training serve as a barrier to their effective resource utilization (Zaripov et al., 2024). Digital tools in education will deliver their maximum benefits only when systematic solutions handle resistance to change and insufficient training with inadequate technical assistance. Educational institutions must make efforts to prepare their teachers adequately for digital technology usage so they can maximize its benefits, which lead to improve learning outcomes.

5. CONCLUSION

Digital technology represents a critical element that empowers teachers to enhance their professional skills across all educational institutions in the Kingdom of Saudi Arabia, particularly in Al-Ahsa. The research data revealed the current state of digital technology usage in the educational process by teachers, as well as its role in developing their professional competence. A research gap was identified highlighting the need for specific interventions to bridge the divide between awareness of digital resources and their effective implementation to improve teaching efficiency among educators. This study outlined key frameworks for future investigations, which should focus on identifying best practices and creating comprehensive support solutions for the seamless integration of digital tools, including artificial intelligence-based platforms, into educational institutions. School faculty must lead the adoption of modern technology alongside proactive training programs along with administrators and policymakers. The full benefits of digital innovation can only be realized when core educational values remain intact. This study recommended the need for research informed professional development initiatives targeting the enhancement of teachers' digital competencies and improving their instructional capabilities. Schools should initiate programs that include carefully planned workshops combined with collaborative learning opportunities, alongside continuous technical assistance mechanisms, to teach educators how to master the use of digital tools.

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Transparency: The author states that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
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APPENDIX

Appendix A. S1: questionnaire on the reality of digital technology in schools.

No.	Phrase	Strongly applies	Applies	Neutral	Does not apply	Strongly not applicable
Axis one: Hardware						
1.	Schools provide modern computers that are sufficient for the needs of students and teachers.					
2.	Electronic devices are maintained periodically to ensure their continued operation.					
3.	Projectors and smart screens are available in all classrooms.					
4.	Tablets are provided to students to support the educational process.					
5.	The school environment is equipped with technologies that help enhance digital learning.					
Axis two: Software						
6.	Schools provide specialized educational software that supports curricula.					
7.	Software is updated periodically to ensure its effectiveness.					
8.	The software used is easy to use and suits the needs of students and teachers.					
9.	Software is available that supports interactive learning and educational activities.					
10.	Teachers are trained to use educational software effectively.					
Axis three: Databases						
11.	Student and teacher data is stored securely and organized.					
12.	Schools provide a database management system that helps track academic achievement.					
13.	Databases are used to support educational decision-making.					
14.	Teachers and administration can easily access databases.					
15.	Databases are protected from hacking or unauthorized access.					
	Axis four: Networks					
16.	Fast and reliable internet is available throughout the school.					
17.	Networks are well secured to protect data and information.					

Continue.

No.	Phrase	Strongly applies	Applies	Neutral	Does not apply	Strongly not applicable
18.	An intranet is available to facilitate communication between teachers and management.					
19.	Network access is provided to students to support e-learning.					
20.	Network infrastructure is maintained periodically to ensure continuity of service.					
Axis five: Human resources						
21.	Teachers are competent to use digital technology in teaching.					
22.	Ongoing training opportunities are available for teachers to improve their digital skills.					
23.	Specialized technicians are appointed to provide technical support in the field of technology.					
24.	School management encourages teachers to use technology in teaching.					
25.	Teachers' performance in using technology is evaluated periodically.					

Appendix B. S1: Questionnaire on the teachers' professional competence.

No.	Phrase	Strongly applies	Applies	Neutral	Does not apply	Strongly not applicable
1.	I am committed to attending on time and ensuring regularity in work.					
2.	I show dedication in preparing and planning lessons well.					
3.	I use diverse teaching methods that suit the different needs of students.					
4.	I encourage students to participate actively in classes.					
5.	I provide a safe and supportive learning environment for students.					
6.	I use modern technology effectively in the educational process.					
7.	I provide constructive feedback to students to improve their performance.					
8.	I collaborate with my colleagues to improve the educational process.					
9.	I follow up on students' progress and provide the necessary support to struggling students.					
10.	I adhere to professional ethics and show respect for students and my colleagues.					
11.	I participate in school activities and development programs.					
12.	I show flexibility in dealing with educational challenges and difficulties.					

No.	Phrase	Strongly applies	Applies	Neutral	Does not apply	Strongly not applicable
13.	I use diverse technological assessment methods to measure students' understanding.					
14.	I work on developing his professional skills through continuous training.					
15.	I contribute to promoting positive values and behaviors among students.					
16.	I use technology as interactive and attractive educational methods.					
17.	I use technology to evaluate students' performance quickly and accurately.					
18.	Technology has contributed to my participation in online training courses and workshops.					