**INFLUENCE THE DIGITAL COMPETENCIES AND AI USAGE ON ISLAMIC TEACHERS’ FUNCTIONAL SKILLS IN SOUTHERN PAKISTAN**

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**Abstract**

This study investigates the influence of digital competencies and artificial intelligence (AI) usage on the functional skills of Islamic secondary school teachers in Southern Pakistan. As digital transformation accelerates globally, the effective integration of AI and digital tools in education raises important questions about teacher preparedness, digital literacy, and the evolving nature of classroom instruction. This quantitative research analyzes responses from 450 Islamic teachers selected based on specific study criteria across rural regions of South Punjab. Data were analyzed using SPSS 22, and multiple linear regression was applied to measure the effect of digital competencies and AI use on functional teaching skills. The results reveal that digital competencies have a significant impact on functional skills development (p = 0.000 < 0.05), while AI usage also shows a statistically meaningful influence (p = 0.003 < 0.05), though adoption remains moderate due to resource and training limitations. These findings emphasize the importance of equipping teachers with relevant digital skills and ethical AI integration strategies. This study contributes to the growing discourse on educational technology in religious contexts and provides practical insights for policymakers, teacher educators, and school leaders to design culturally appropriate digital training frameworks that empower Islamic teachers in rural Pakistan.

**Keywords:** Digital Competencies, Artificial Intelligence (AI), Functional Skills, Islamic Education, Teacher Development, Southern Pakistan.

**INTRODUCTION**

Schools across the globe are increasingly embracing digital transformation to enhance teaching and learning practices. The integration of digital tools, artificial intelligence (AI), and Information and Communication Technologies (ICT) in classrooms significantly shifts how teachers deliver content and how students absorb knowledge. In this context, digital competencies and AI adoption have emerged as critical drivers of functional skill development, especially for educators operating in technology-limited settings such as rural Pakistan. Teacher success in applying digital strategies relies not only on access to devices or infrastructure but heavily on their own digital skills and confidence in using advanced tools effectively (Zhao et al., 2002).

In Pakistan’s Islamic secondary schools, where cultural and religious norms play a central role in pedagogy, digital readiness among educators is both a challenge and an opportunity. Teachers' digital competencies—defined as their ability to access, evaluate, and utilize technology effectively—significantly affect how well they can implement technology to foster 21st-century skills (Šabić et al., 2022). Yet, teachers in many parts of Southern Punjab still lack adequate training and resources, limiting their ability to support student learning through digital means. This becomes even more critical with the rise of AI-powered educational platforms, which offer personalized learning, intelligent feedback, and administrative automation—features that can empower or alienate educators depending on their skills and trust levels (Ramorola, 2013; Bøe, 2018).

Islamic school teachers in Pakistan face additional pressures to ensure that technology use aligns with religious teachings and ethical values. Functional skills such as digital communication, collaboration, critical thinking, and problem-solving are essential for teachers to thrive in a tech-integrated classroom. However, these skills are directly influenced by the educators’ digital literacy and willingness to adopt AI tools that meet both educational and spiritual standards (Alotaibi, 2023). The degree to which Islamic teachers feel competent and secure in using such technologies affects their classroom performance, pedagogical outcomes, and student engagement (Mundy et al., 2012).

Previous studies have addressed various factors influencing technology integration in education, but limited research has explored how digital competencies and AI specifically influence functional skills in Islamic school contexts. Furthermore, rural and culturally specific regions like Southern Punjab remain underrepresented in empirical research (Salehi & Salehi, 2012). Therefore, this study aims to fill that gap by examining how digital skills and AI usage shape Islamic secondary teachers’ functional capabilities in Southern Pakistan, with particular attention to their ethical perspectives and pedagogical responsibilities.

This research focuses on the intersection of digital competencies, AI integration, and their influence on functional skills in teaching within Islamic institutions in Southern Punjab. The findings aim to inform policymakers, curriculum developers, and educational leaders about the real-world barriers and facilitators for technology adoption among religious school educators. By understanding these dynamics, stakeholders can design tailored digital literacy and AI training programs that respect Islamic values while empowering teachers to lead 21st-century classrooms.

**METHOD**

This research adopted a **quantitative research design** to examine the influence of digital competencies and artificial intelligence (AI) usage on the functional skills of Islamic secondary school teachers in Southern Pakistan. The study is grounded in **empirical data collection**, where measurable variables were used to explore relationships and test hypotheses statistically (Sugiyono, 2018). The design allows for generalizing findings from the sample to a broader population of teachers.

A **purposeful sampling technique** was used to select participants based on specific criteria related to teaching roles, digital exposure, and subject alignment within Islamic secondary schools. This sampling method was guided by **Purposeful Measurement**, a sampling framework that links participant characteristics with research variables to enhance result relevance (Sugiyono, 2018).

Data were collected using a **structured questionnaire** distributed through a Google Form link. A total of **450 Islamic secondary school teachers** from the Kot Addu District, South Punjab, participated in the survey. The questionnaire was designed to assess three core variables: **digital competencies**, **AI integration in teaching**, and **functional teaching skills** within the Islamic education context.

The study utilized **SPSS version 27** for data analysis. Statistical procedures included **validity and reliability testing**, **descriptive statistics**, **multiple linear regression**, and **heteroscedasticity tests** to determine the consistency and predictive strength of the variables. Furthermore, a **t-test** was employed to assess the significance of the relationships between digital competencies, AI usage, and the development of teachers’ functional skills. The approach ensured a robust and structured analysis of how digital transformation and AI influence instructional practices in faith-based educational settings.

### Data Source and Collection

Since the primary aim of this research was to obtain factual insights and reliable findings, a **quantitative research approach** was adopted. To gather direct and accurate responses from participants, the researcher developed a **structured questionnaire** and distributed it in person as well as through online platforms. In line with Sugiyono’s (2017) definition, **primary data** refers to original information obtained directly from the source, which in this case were **Islamic secondary school teachers in Southern Pakistan**.

The researcher used **Google Forms** as a digital data collection tool to enhance accuracy and accessibility. The questionnaire was designed to assess **teachers' digital competencies, their usage of AI technologies in education, and how these factors influence their functional teaching skills**. The form was sent to participants via direct invitation links, allowing for efficient and organized data collection.

Participants were selected from **Islamic secondary schools across the Kot Addu District in South Punjab**. A total of **450 teachers** were purposively sampled based on their active teaching roles, access to digital tools, and experience with AI-assisted instruction. All respondents voluntarily completed the questionnaire online through the provided Google Form link. Following Sugiyono (2017), this approach ensured the collection of **primary data that was relevant, timely, and reflective of the current technological integration in Islamic educational institutions**. The researcher prioritized accuracy and completeness in collecting the responses to ensure that the data was suitable for rigorous statistical analysis.

### Study Area

This research was conducted in **Kot Addu District**, located in the southern region of **Punjab Province, Pakistan**. The area is characterized by a predominantly rural population, where a significant portion of families rely on **seasonal labor and informal work** for their livelihood. Economic limitations and unequal resource distribution have a notable impact on educational development in this region.

The **educational institutions**, including **Islamic secondary schools**, operate under national education policies guided by **Article 25-A of the Constitution of Pakistan (1973)**, which ensures the provision of **free and compulsory education** for all children. Despite government efforts, many schools in this district face challenges related to **infrastructure, access to digital tools, and teacher training**.

Kot Addu’s socio-economic dynamics are further influenced by **local landowners** who hold considerable economic power and shape the availability of educational resources. These conditions make it a relevant area to examine how **digital competencies** and **artificial intelligence (AI) usage** affect **Islamic teachers’ functional skills**, especially within under-resourced educational settings.

### Data Collection Methods and Sampling Technique

This study adopted a **quantitative research method** to explore the influence of **digital competencies** and **AI usage** on the **functional skills** of Islamic secondary school teachers in **Southern Pakistan**. The research focused on understanding how teachers utilize digital tools and artificial intelligence in their instructional practices and how these elements impact their professional abilities.

Data were collected using a **structured questionnaire**, designed to assess teachers’ levels of digital competency, their exposure to and application of AI tools, and the ways these technologies support their day-to-day classroom functions. The survey also inquired about teachers’ training experiences, comfort levels, and perceived barriers in using digital and AI-based educational tools.

A total of **500 questionnaires** were distributed to Islamic secondary school teachers across **District Kot Addu**, using a **purposeful sampling technique** to select participants who were actively teaching in Islamic institutions. Out of these, **450 valid responses** were received and analyzed. The sampling focused on individuals with varying teaching experiences, subject specializations, and access to technology to capture a diverse perspective.

The collected data were analyzed using **SPSS (version 22)** to perform descriptive and inferential statistics, including multiple linear regression analysis to determine the relationship between digital competencies, AI usage, and functional teaching skills. Ethical considerations were followed throughout the data collection process, with informed consent obtained from all participants, and data confidentiality ensured.

**Conceptual framework**

 In this study, the **conceptual framework** is designed to examine the potential influence of **digital competencies** and **AI usage** on the **functional skills** of Islamic secondary school teachers in **Southern Pakistan**. This research investigates how well teachers are equipped with digital skills, how they integrate AI tools into their educational practices, and how these factors collectively contribute to their professional effectiveness in the classroom. The conceptual framework of this research is presented below:

|  |
| --- |
| Functional skillsCritical Thinking Problem SolvingDigital CompetenciesAI usage Time management  |

**Figure 1.1 Conceptual Framework**

### Hypotheses

Islamic secondary school teachers in Southern Pakistan increasingly engage with digital tools and AI to enhance their functional teaching skills. This study explores how digital competencies and AI usage influence the ability of teachers to perform effectively in the classroom. It also investigates the extent to which confidence in using these technologies contributes to the improvement of their functional skills. The following hypotheses guide this research:

**Hypothesis 1:** There is a significant relationship between digital competencies and the functional skills of Islamic secondary school teachers in Southern Pakistan.

**Hypothesis 2:** There is a significant relationship between AI usage and the functional skills of Islamic secondary school teachers in Southern Pakistan.

**Hypothesis 3:** There is a significant impact of digital competencies and AI usage on the functional skills of Islamic secondary school teachers in Southern Pakistan.

**Hypothesis 4:** There is a combined effect of digital competencies and AI usage on the functional skills of Islamic secondary school teachers in Southern Pakistan.

**Hypothesis testing**

Testing hypotheses based on sample data represents the core principle of hypothesis testing. This research applies key statistical methods that analyze frequency-based data to explore relationships between variables. Significance testing allows us to determine whether variations in independent variables (X) produce measurable changes in the dependent variable (Y).

In this study, **digital competencies** and **AI usage** serve as the independent variables. The dependent variable is the **functional skills of Islamic secondary school teachers** in Southern Pakistan's Kot Addu district. To assess these relationships, we use the **t-test** as our primary analytical tool.

As stated by Widarjono (2010), the t-test evaluates the effect of individual independent variables on the dependent outcome. This method allows us to determine the significance and strength of influence that digital competencies and AI usage have on teachers’ functional performance in educational settings.

**RESULT AND DISCUSSION**

**Result**

 **Table 1. Digital competencies influence the functional skills**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Kot addu | Khan Bela | Daira Din Panah | Nawan chowk |
| Male | 19.62% | 08.18% | 16.09% | 11.44% |
| Female | 6.32% | 12.65% | 10.76% | 14.97% |
| Total  | 25.94 | 20.83 | 26.85 | 26.41 |

It shows that male teachers in Kot Addu Tehsil did 19.62% of the work and female Teachers as a whole completed 25.94% of total tasks in all schools. 20.83% of teaching tasks came from Khan Bela Tehsil teachers where males performed 08.18% and females completed 12.65%. Out of all work in Tehsil Daira Din Panah male teachers delivered 16.09% whereas female teachers completed 10.76% for a combined result of 26.85%. Teachers in Nawan Chowk Tehsil handled 11.44% of the teaching work but female teachers managed only 14.97%.

Together, they did 26.41 percent. The teachers in Tehsil Nawan Chowk performed 14.97% better than their male counterparts. However, this outcome was higher than the 12.65% result achieved by female educators in Tehsil Daira Din Panah. The female teachers in Nawan Chowk Tehsil received better outcomes from digital resources because they mastered technology tools faster than their male counterparts in Kot addu.

**Table 2. AI usage enhance Islamic teacher’s functional skills in delivering religious content**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Kot addu | Khan Bela | Daira Din Panah | Nawan Chowk |
| Male | 14.44% | 10.13% | 7.59% | 10.42% |
| Female | 08.30% | 08.96% | 13.00% | 20.95% |
| Total | 22.74% | 29.09% | 20.59% | 31.37% |

In Kott Addu Tehsil male teachers worked 14.44% of the lessons while female teachers taught 08.30%. Together, they did 22.74%. In Khan Bela Tehsil the male teachers handled one fifth of the work while female teachers performed one tenth. Together, they did 29.09%. The teaching workload of Tehsil Daira Din Panah split 7.59% for men and 13.00% for women. Together, they did 20.59%. At Tehsil Nawan Chowk males taught 10.42% of the lessons while females delivered 20.95% of instruction.

Together, they did 31.37%. The data shows female teachers in Tehsil Daira Din Panah handled 20.59% more work than male teachers while they only earned 7.59% more tasks in Tehsil Daira Din Panah. Female teachers at Nawan Chowk outperformed male teachers at Khan Bela when it came to how much they AI usage enhancing functional skills for educational work.

**Table 3. Combined effect of Digital competencies, and AI usage of Islamic functional skills.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Kot addu | Khan Bela | Daira Din Panah | Nawan Chowk |
| Male | 12.05% | 13.13% | 7.22% | 08.77% |
| Female | 17.24% | 09.96% | 11.45% | 17.70% |
| Total | 29.29% | 23.09% | 19.67% | 26.47% |

Based on our findings male teachers in Kot Addu Tehsil made up 12.05% of total while female teachers represented 17.24% but still achieved 29.29% overall in teaching performance. Khan Bela Tehsil reported 13.13% male participation compared to 09.96% female participation but achieved 23.09% total success. Daira Din Panah Tehsil had 07.22% male teachers combined with Female participants ranked first in Nawan Chowk Tehsil at 08.77% more than Khan Bela Tehsil’s 09.96%. In the Kot addu area male students outperformed female students in our evaluation of digital tools and teacher AI usage.

**Table 4.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Use of digital tools, of secondary teachers ‘functional skills on technology. | SS | S | TS | STS |
| I feel confident using digital tools to enhance my teaching practices. | 19 | 80 | 3 | 4 |
| Digital tools positively influence my ability to uphold ethical standards in teaching. | 16 | 72 | 18 | 0 |
| I can use AI for deliver Content that my colleagues use digital tools in ethically responsible ways. | 9 | 58 | 37 | 2 |
| Digital competencies tools, teachers' trust in technology for educational purposes. | SS | S | TS | STS |
| I feel confident in troubleshooting basic technical issues while using AI tools in the classroom. | 7 | 61 | 34 | 4 |
| I can effectively integrate AI tools into my lesson plans to improve student learning outcomes. | 22 | 79 | 5 | 0 |
| I feel capable of learning new digital tools and technologies for teaching purposes. | 14 | 85 | 7 | 0 |
| Combined effect of digital tools, AI and Digital competencies of secondary teachers in ethics of technology for educational purposes. | SS | S | TS | STS |
| Digital tools enhance my ability to teach effectively. | 13 | 72 | 20 | 1 |
| I can use AI for teaching maintain data security and privacy.  | 14 | 58 | 31 | 3 |
| I can effectively use AI tools to manage my classroom activities. | 12 | 61 | 28 | 5 |

The verification team tested the study outcomes based on research conducted with 450 participants. Nine observations across X1 (computer self-efficacy), X2 (digital literacy), and Y (trust in technology use) gained validation status during the testing process. The nine questions reflect the level of functional digital skills and ethical technology use among secondary school teachers. The study confirms that participants from Islamic secondary schools demonstrate strong digital confidence and practical competence in using ICT tools. All evaluated variables surpassed the minimum Pearson correlation score of 0.1891 at the 0.05 significance level, confirming the statistical validity of the instrument. Checking the validity of these nine items ensures the reliability of the data interpretation. Teachers agreed that they feel confident using digital tools to enhance their teaching practices and believe that digital resources support ethical standards in education. Many participants reported that they can troubleshoot basic technical issues and integrate AI tools into their lesson plans. Teachers also indicated that they are capable of learning new digital tools, managing classroom activities with AI, and protecting data privacy in digital teaching. Through their responses, it is clear that digital teaching tools make their instruction more effective and meaningful, and that they trust technology to positively impact student learning outcomes.

The study analyzed responses from 450 secondary school teachers to assess their functional skills in using digital tools, AI integration, and their trust in technology for educational purposes. The findings indicate a generally high level of digital confidence among respondents. A majority of teachers agreed (80) or strongly agreed (19) that they feel confident using digital tools to enhance their teaching practices. Similarly, most teachers (72) agreed that digital tools positively influence their ability to uphold ethical standards in education. While 58 teachers expressed agreement in using AI to deliver content in ethically responsible ways, a significant portion (37) were somewhat neutral, suggesting ongoing development is needed in AI ethics. Regarding digital competencies and trust in technology, 61 teachers agreed they can troubleshoot basic technical issues using AI tools in class, while 34 were somewhat sure, pointing to a moderate level of technical self-efficacy. Notably, 79 teachers agreed they could effectively integrate AI tools into lesson plans, and 85 expressed confidences in learning new technologies for teaching—demonstrating a strong foundation in digital adaptability.

In exploring the combined impact of digital tools and competencies on ethical teaching, most teachers agreed (72) that digital tools enhance teaching effectiveness, and 58 believed they could use AI while maintaining data security and privacy. When asked about classroom management through AI, 61 agreed and 28 were somewhat sure. These results reflect a consistent pattern of digital trust and skill development among secondary teachers, with particular strength in digital learning adaptation and a moderate need for deeper training in AI ethics and privacy. This data supports the conclusion that secondary teachers show high levels of readiness and functional capability in integrating digital tools for effective and ethical teaching.

**Table 5. Descriptive Statistics**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | N | Range | Min | Max | Means | Std.Deviation | Variances |
| Digital competencies skill (X1) | 440 | 4 | 3 | 9 | 5,22 | 1,570 | 2.160 |
| AI usage (X2) | 440 | 9 | 3 | 10 | 7.08 | 1,355 | 2,119 |
| Functional skills Y) | 440 | 9 | 3 | 12 | 6.57 | 1,977 | 4,520 |
| Valid N (listwise) |  |  |  |  |  |  |  |

According to this table, 440 teachers sent their responses. The scale of digital competencies skill (X1) runs between 3 for low users up to 9 for advanced users. These results demonstrate that teacher responses to digital competencies span the score from 3 to 9. The table shows that the standard deviation of 1.570 ranks slightly below the average score of 5.22, indicating moderate variation in digital skill levels among respondents. Given that our measurement scale for AI usage (X2) runs from 3 to 10, the results show a wide range of responses. The average score is 7.08, with a standard deviation of 1.355, reflecting a consistent yet slightly dispersed level of AI usage among participants. For functional skills (Y), the scale ranges from 3 to 12, showing the broadest span among the variables. The average score is 6.57, with a standard deviation of 1.977, suggesting greater variation in responses.

 The variance for functional skills is also the highest at 4.520, compared to 2.160 for digital competencies and 2.119 for AI usage. This indicates that while most teachers show moderate to high skill levels, functional digital abilities differ more significantly across the sample group.

**Hypothesis testing**

**T test**

**Table 6. t test**

**Coefficients a**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Unstandardized Coefficients  | StandardizedCoefficients  | t | Sig. |
|  | B | Std. Error | Betas |  |  |
| 1 (constant) |  |  |  |  |  |
| Digital literacy skills (X1) | 1,539 | ,547 |  | 2,949 | ,003 |
| Computer self-efficacy (X2) | ,657 | ,335 | ,468 | 1,868 | ,065 |
| Functional skills (Y) | ,716 | ,162 | ,678 | 4,123 | ,000 |

Experiments show significant relationships between teachers’ digital competencies and functional skills with p-values of 0.003 and 0.000 respectively, while AI usage shows a less significant impact with a p-value of 0.066. Our research suggests that H1 should be supported, as the p-value for digital competencies skills (X1) is 0.003, which is below the 0.05 threshold, indicating a significant relationship. School administrators in Islamic secondary schools across Kot Addu, Pakistan observed that digital competency levels positively influence teachers’ functional skills. However, our analysis shows H2 should be rejected because AI usage (X2) recorded a p-value of 0.066, which exceeds the 0.05 significance level. This suggests that AI usage alone does not have a statistically significant effect on functional skills in this context. Finally, the results strongly support H3, as the functional skills variable (Y) shows a highly significant p-value of 0.000, confirming a strong relationship between functional digital skills and the ethical use of technology in teaching. Our evaluation concludes that the combination of digital competencies and functional abilities plays a critical role in shaping ethical technology practices among Islamic secondary school teachers in Kot Addu, South Pakistan.

**Recommendations**

Based on the findings of this study, it is recommended that educational policymakers and school administrators in Southern Pakistan prioritize structured digital literacy and AI training programs for Islamic secondary school teachers. Since digital competencies significantly influence functional skills, targeted professional development should focus on enhancing teachers’ confidence and capabilities in using digital tools for ethical and effective instruction. While AI usage shows potential, its impact remains limited due to a lack of training and resources.

Therefore, integrating culturally relevant and faith-aligned AI training modules could support greater acceptance and ethical implementation. Additionally, providing equitable access to technology, particularly in under-resourced rural areas like Kot Addu, will help bridge digital gaps and support teachers in meeting the evolving demands of modern classrooms. Overall, empowering teachers with the right tools, skills, and ethical guidelines will ensure better instructional outcomes and support the sustainable integration of technology in religious education settings.

**Findings**

The study reveals notable insights into the digital competencies and AI usage of Islamic secondary school teachers in Kot Addu, South Pakistan. Digital competencies significantly influence functional skills, as evidenced by a p-value of 0.003, which is below the 0.05 threshold, confirming a strong relationship between teachers' digital skills and their teaching effectiveness. This suggests that as teachers develop their digital skills, their ability to effectively teach and utilize technology in their classrooms improves. In contrast, AI usage had a less significant impact, with a p-value of 0.066, exceeding the 0.05 significance level, meaning that AI usage alone does not significantly enhance teachers' functional skills in this context.

Regarding the combined effect of digital competencies and AI usage on ethical technology use, the study found that these factors are critical in shaping teachers' ethical practices, with a p-value of 0.000 for the relationship between digital skills and ethical technology use, which strongly supports the hypothesis that digital competencies play a pivotal role in fostering ethical technology usage.

The descriptive statistics also highlight that teachers in the region exhibit varying levels of proficiency across the three key areas: digital competencies, AI usage, and functional skills. While the average score for digital competencies was moderate (mean = 5.22), it displayed some variation among teachers (standard deviation = 1.570). AI usage had a higher average score of 7.08, suggesting more consistent usage but still with some disparity (standard deviation = 1.355). Functional skills, however, showed the most variability (mean = 6.57; standard deviation = 1.977), indicating that while most teachers have moderate to high functional skills, there is a significant difference in how effectively they apply these skills in the classroom.

Further analysis of teaching performance across different regions within the Kot Addu Tehsil revealed that female teachers outperformed their male counterparts in several key areas. In particular, female teachers in Nawan Chowk Tehsil demonstrated the highest proficiency in using digital tools and AI to enhance their teaching, with a total of 31.37% of teaching tasks performed compared to 26.47% in Daira Din Panah Tehsil and 23.09% in Khan Bela Tehsil. This performance indicates that gender plays a role in how quickly teachers master and apply these technologies. Additionally, AI usage in religious content delivery had a positive effect, particularly in Khan Bela and Nawan Chowk Tehsils, where female teachers reported a higher success rate in integrating AI tools into their lessons.

Overall, the study suggests that while AI usage alone does not significantly influence teachers' functional skills, a combination of digital competencies, AI usage, and ethical technology use is crucial for the professional growth and development of Islamic secondary school teachers. The variability in responses emphasizes the need for customized professional development programs to address the diverse needs of teachers in this region.

**CONCLUSION**

In conclusion, this study highlights the significant role of digital competencies in enhancing the functional skills of Islamic secondary school teachers in Kot Addu, South Pakistan. The results indicate that teachers who possess higher digital competency levels are better equipped to integrate technology into their teaching practices effectively. However, the impact of AI usage on teachers' functional skills was found to be less pronounced, suggesting that while AI tools are useful, they require more structured implementation to truly enhance teaching outcomes. Moreover, the study underscores the importance of ethical technology use, as teachers with strong digital skills were more likely to demonstrate responsible and effective use of technology in their classrooms. The findings also reveal notable gender differences in technology adoption, with female teachers in certain regions outperforming their male counterparts, particularly in leveraging AI tools.

These insights point to the need for targeted professional development programs that cater to the diverse skill levels and technological needs of teachers. Ultimately, the research emphasizes that a holistic approach, integrating digital competencies, AI usage, and ethical practices, is essential for fostering effective teaching in the digital age. To ensure sustained improvement, it is critical to address the varying levels of digital skills among teachers and provide ongoing support to help them fully realize the potential of technology in education.

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