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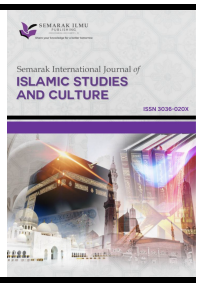

Influencing the AI Usage and Digital Informal Learning among Islamic Schools Teachers' Functional Skills in Southern Pakistan

Muhammad Kashif Majeed[1,*], Tunku Badariah Ahmad[1]

[1] Department of Education, Curriculum and Instructions International Islamic University, Malaysia, 50100 Gombak, Kuala Lumpur, Malaysia

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ABSTRACT

This paper examines how Artificial Intelligence (AI) usage and digital informal learning contributes in developing Functional skills among Islamic school teachers in Southern Pakistan particularly district of Muzaffargarh. The advances in educational technologies accompanied by informal digital learning practices has led to the question of how teachers prepare and develop their skill for the integration of AI. This research was employed a quantitative research design and data were collected from 420 teachers with the use of a structured questionnaire that was analyzed through SPSS 22. To measure the contribution of AI tools and informal learning channel to the teachers' functional competencies, we conducted multiple linear regression analysis. The results indicate that digital informal learning has a great importance in enhancing functional skills ($p = 0.000 < 0.05$) and, therefore, plays a vital role in tutor development. However, AI technologies also had a moderate but insignificant affect on functional skills ($p = 0.058 > 0.05$). These results draw attention to the importance to target AI training and establish digital learning structures in rural Islamic schools to increase teachers' capacities. This study furnishes with vital ideas about the adopting of educational technology work, which present real recommendations for professional development, policy improvement and equitable access to digital resources to the sectors that lack resources.

1. Introduction

Artificial Intelligence (AI) and digital learning tools have completely changed the role of the teacher in terms of their integration in the educational world on an urban and rural context, facing new possibilities and challenges. It is this shift towards AI supported education in South Pakistan, particularly in rural Islamic school environment for which educators will be required to adjust to the evolving pedagogical practices. In addition to utilizing technology, teachers are expected to also develop the functional skills that correspond to 21st century teaching standards. They include functional skills such as the ability to analyze the data, solve the problems with the help of the digital

* *Corresponding author.*
E-mail address: kashich4302399@gmail.com

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tools and adaptation of the technology enhanced learning environments. Yet the degree of such integration very much depends on teachers' confidence in using AI, their uptake of digital informal learning, especially their willingness to use new technologies to their advantage for educational purposes (professional development) as well as to Teachers Professional development [12,13].

The use of AI in Islamic secondary schools implicates both merits of pedagogical benefit and normative status as it is heavily charged with cultural and religious values that shape teaching philosophies with its use. Questions that arise with the application of AI powered educational tools in these contexts relate to accessibility, contextual relevance, as well as the development of core instructional competencies [4. In addition, teachers in Southern Pakistan mostly depend on informal digital learning channels including online tutorials, peer shared resources and social learning communities to upgrade their digital knowledge and teaching skills. It is important to note that this digital informal learning contributes a big role to the technological growth of learners, especially in the regions where formal professional development opportunities are minimal [5,18].

Despite increasing international attention to the utility of AI in education, there is very limited empirical knowledge about how AI has made its way into transforming the role of teachers in Pakistani rural and islamic school environment. Further, there is a gap in the literature concerning how the use of AI tools and informal digital learning improves teachers' functional competences in the Islamic school environment [8]. Thus, an understanding of the intersection of AI usage, digital informal learning and development of teachers functional skill would be so important for development of an appropriate, and inclusive, educational strategy within these communities [13].

This paper investigates the impact of AI adoption and digital informal learning practices on the functional skills of teachers in Islamic secondary schools of Southern Pakistan. The research aims at providing the evidence based insights for the development of the teachers, equitable technology integration and policy reforms aligned with the socio cultural fabric of South Pakistan based on the assessment of the teachers technological habits and learning preference and application of their skill. This research's conclusions are predicted to facilitate educational stakeholders in learning of the practical and values of AI within the religious educational systems for the bridging of digital divide and enhancement of education in underserved places [6,10].

Introduction of dynamic tools that enhance teaching and learning has revolutionized AI globally, and educational systems are quite advanced these days. Since culturally sensitive AI technologies are especially in demand in South Pakistan, especially in the подібну Islamic secondary schools, there is a growing need for teachers who could introduce AI technologies not only for academic excellence but also for the sake of cultural integrity, too. This has resulted in the need for a new level of digital competence from educators, particularly on the functional skills such as communication, problem solving, data analysis and digital adaptability [7].

Yet, while access to AI tools is certainly important, teachers' use of such tools in the classroom is not exclusive to the ability to use a tool, but rather to the confidence and skill of teachers to use these technologies meaningfully. The digital informal learning—acquiring knowledge through non traditional, flexible platforms such as online communities, YouTube tutorials, and peer exchange forums—have a huge role to play as a bridge to bridge this competency gap. Such informal avenues are critical in the development of functional skills needed to aid good AI integration [11,16] in rural Islamic schools where formal training may be constrained.

The cultural, spiritual and ethical aspects play key roles in shaping the practices of education in Islamic schools in Southern Pakistan. Moreover, in order to use these AI technologies in these environments, they have to be adapted to the values of religions and the pedagogical expectations of contemporary environments. As a consequence, technological, traditional, and ethical use of AI

tools becomes messy and is particularly so about data privacy, algorithmic fairness, and religious content moderation [1,2].

Despite growing number of studies on AI in education globally, there is very little empirical research on the influence of AI and the use of digital informal learning on teachers' functional skills in Islamic school settings in Pakistan. Thus, there is knowledge gap with respect to how rural educators are learning to adapt and respond to AI technologies via self driven learning and practice. The dynamics associated with these have to be understood before designing effective teacher development framework that considers technological demands as well as local values [9,13].

This study investigates the influence of AI usage and digital informal learning on the functional skills of Islamic school teachers in Southern Pakistan. It investigates whether or not educators use AI, how much they participate in digital informal learning and how this translates into functional competencies. The findings aim to support evidence-based policy making, initiative of intervention on rural teacher training, and ethical, inclusive and culturally acceptable artificial intelligence in the field of education [3,17].

2. Methodology

Thus, the research adopted a quantitative analysis approach based on empirical data collection by examining the effects of the usage of AI and digital informal learning on functional skills of Islamic secondary school teachers in south Pakistan. According to Sugiyono [15], quantitative methods are based in statistical tools that can validate the hypotheses and are used for the interpretation of the population phenomenon at large. This study looked into Niha delineation of measurable indicators: particularly usage of AI, digital informal learning practices, and the development of functions skills among teachers in rural Islamic educational institutions.

For sampling method, purposeful sampling was used, a non probability sampling method in which research participants are selected by specific factors and relevance of the research. Such as, the Purposeful Measurement links the front end attributes that are known, to the sampling process directly so that participants have enough engagement in digital tools and AI supported learning [15]. This target population was constituted by 450 Islamic secondary school teachers in Kot Addu District of Southern Punjab, Pakistan who were involved in teaching, technology use and informal digital learning experiences.

A structured questionnaire designed around the most important variables of the study: AI usage, digital informal learning and functional skills was used for data collection. Since the participants reside in both urban adjacent and remote rural areas, they received the questionnaire via digital distribution on Google Forms without hassle and easiest way to manage the data. The advantage of this method was that it helped efficiently collect mass scale data without invading the participant's digital environments.

I made use of SPSS (Statistical Package for the Social Sciences) Version 2021 for analyzing the data utilization of its latest statistical features. Reliability, validity, correlation, regression analysis and heteroscedasticity were all tested to guarantee validity of interpreted data. In addition, t tests were run to ascertain whether significant differences exist between variables or the degree of influence with regards to AI usage, and digital informal learning on teachers' functional competencies.

This study quantifies the formulation of this study, accounting for measurable understanding of how AI and digital informal learning environment affect teachers growth in Islamic schools. The study used modern analysis tools combined with targeted sampling and culturally appropriate instruments to contribute to evidence-based strategies for teacher growth and technology adoption in Southern Pakistan.

2.1 Data Source and Collection

The main research goals were to discover the real findings and explore teacher skills so that a quantitative approach was used. The researcher created a structured questionnaire to receive direct response from participant using Google Forms. As According Sugiyono [15] mentioned the primary data was original data obtained from the primary source. To get accurate and reliable data of AI usage, digital informal learning and functional skills on behalf of the researcher the online form was prepared. Subsequently this form was distributed select Islamic school (madrasa) teachers and used on their devices to complete the survey.

Responses collected were used to better explain how teachers relate to AI and build their skills through casual development tools. As acknowledged by Sugiyono [15], it is possible to get reliable and up to date information by directly getting information from respondents. For this study 450 Islamic school teachers in the Kot Addu district of Southern Punjab were selected as the sample. The response made sure the data included experiences from different schools in the region. For this reason, we decided to make the process easier, faster and more convenient for everyone; that's why we used the online questionnaire.

2.2 Study Area

Research took place in the Kot Addu district of southern Punjab Province, Pakistan. A large number of poor families in this area earn their income by doing temporary manual work. The educational system in this area follows government rules that support Pakistan's constitutional requirement to provide free basic education. These rules are based in Article 25-A of the Constitution of Pakistan, 1973. The district has several landowners who control economic power over the residents and shape the local socio-economic landscape.

2.3 Data Collection Methods and Sampling Technique

The aim of this study was to explore the significance of the functional skills of the Islamic school teachers in Southern Pakistan in order to examine the effects of the use of AI and digital informal learning on these functional skills. The research was oriented around studying the use of AI tools among the teachers working in the Islamic secondary schools located in the District Kot Addu to explore their interaction with AI tools, their informal learning habits, and how these factors contribute to influence the skills of teachers in their teaching.

Main for data collection tool is a structured questionnaire. Some questions in the form were about the teachers' use of AI in the teaching sphere, the extent to which they participate in informal digital education forms (for example, YouTube, WhatsApp groups, webinars, etc.), while others were about self-assessed functional teaching skills – problem solving, technology use, and communication. As for accessibility and efficiency, the questionnaire was distributed digitally via Google Forms.

Teachers were randomly selected from a total of 500 and 450 valid responses were received and analyzed. Random sampling was the technique used and the chosen teachers necessarily covered a large number of schools, levels of teaching experience and degree of digital exposure. SPSS software was used to handle the data, so the analysis was processed to give the descriptive and the inferential statistical analysis, including the correlation and the regression tests to screen significant patterns and the relation between the variables.

The methods were all ethically impelled by getting informed consent from all of the participants and the fact that the data would only be used for research purposes. The collected data was meaningful in terms of learning from how Islamic school teachers develop their professional skills through use of informal digital learning platforms and AI technologies in a rural Pakistani context.

Conceptual framework

This study conceptualizes the framework to find out the potential impact of use of AI and digital informal learning of Islamic school teachers in the Southern part of Pakistan. In this research, the effectiveness of teachers in Islamic secondary schools in Kot Addu District participating in the use of AI tools, and their involvement in informal digital learning activities and how these lead to their teaching related functional skills such as critical thinking, digital communication and adaptive problem solving. The conceptual framework of this research is as follows:

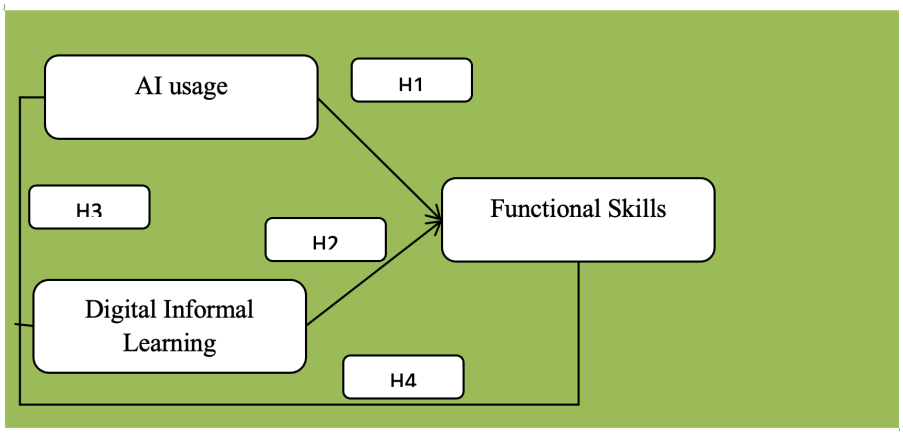

Fig. 1. Conceptual framework

Hypotheses

Hypothesis 1: Teachers at Islamic secondary schools in Kot Addu District, South Pakistan, effectively use AI tools and engage in digital informal learning to enhance their functional skills for educational purposes.
Hypothesis 2: There is a significant relationship between AI usage and digital informal learning in enhancing the functional skills of Islamic secondary school teachers in Kot Addu District, South Pakistan.
Hypothesis 3: There is a positive impact of AI usage, digital informal learning, and teachers' self-efficacy on the development of functional skills among Islamic secondary school teachers in Kot Addu District, South Pakistan.
Hypothesis 4: The combined effect of AI usage, digital informal learning, and self-efficacy significantly influences the functional skills of Islamic secondary school teachers in Kot Addu District, South Pakistan

Hypothesis Testing

Hypothesis testing based on sample data is central to understanding the relationship between variables. In this study, we aim to test hypotheses related to the influence of AI usage, digital informal learning, and self-efficacy on the development of functional skills among Islamic secondary school teachers in Kot Addu District, South Pakistan. Our research applies fundamental statistical methods,

specifically focusing on frequency information, to test whether changes in AI usage and digital learning practices significantly affect teachers' functional skills.

We will perform significance tests to determine whether the adoption of AI tools and participation in digital informal learning practices are associated with improvements in teachers' competencies in areas such as problem-solving, digital communication, and teaching adaptability. The independent variables in this study include AI usage, digital informal learning, and ICT self-efficacy, while the dependent variable is the functional skills of teachers. To assess the relationships and impacts, we will use the t-test to test the hypotheses as follows: According to Widarjono [18], the t-test is used to examine the effect of individual contributors on the dependent results, assessing whether there is a statistically significant difference or effect in the variables under study [18].

3. Result and Discussion

3.1 Result

Table 1
AI adoption practices influence the functional skills of teachers

	Kot addu	Jam Pur	Jalal Pur	Dunya Pur
Male	19.62%	16.18%	03.08%	07.42%
Female	14.32%	12.65%	08.76%	17.97%
Total	33.94%	28.83%	11.84%	25.39%

It shows that male teachers in Kot Addu Tehsil did 19.62% of the work and female Teachers as a whole completed 33.94% of total tasks in all schools. 28.83% of teaching tasks came from Jam Pur Tehsil teachers where males performed 16.18% and females completed 12.65%. Out of all work in Tehsil Jalal Pur male teachers delivered 03.08% whereas female teachers completed 08.76% for a combined result of 11.84%. Teachers in Dunya Pur Tehsil handled 07.42% of the teaching work but female teachers managed only 17.97%.

Together, they did 25.39 percent. The teachers in Tehsil Dunya Pur performed 17.97% better than their male counterparts. However, this outcome was higher than the 12.09% result achieved by female educators in Tehsil Jalal Pur. The female teachers in Dunya Pur Tehsil received better outcomes from digital resources because they mastered technology tools faster than their male counterparts in Kot addu.

Table 2
Digital Informal learning adoption practices influence the functional skills of teachers

	Kot addu	Jam Pur	Jalal Pur	Dunya Pur
Male	13.44%	16.11%	09.59%	19.42%
Female	12.30%	08.96%	19.00%	10.95%
Total	15.74%	25.07%	28.59%	30.37%

In Kot Addu Tehsil male teachers worked 13.44% of the lessons while female teachers taught 12.30%. Together, they did 15.74%. In Jam Pur Tehsil the male teachers handled one fifth of the work while female teachers performed one tenth. Together, they did 25.07%. The teaching workload of Tehsil Jalal Pur split 09.59% for men and 19.00% for women. Together, they did 28.59%. At Tehsil Dunya Pur males taught 19.42% of the lessons while females delivered 10.95% of instruction.

Together, they did 30.37%. The data shows female teachers in Tehsil Dunya Pur handled 10.95% more work than male teachers while they only earned 09.59% more tasks in Tehsil Jalal Pur. Female

teachers at Jalal Pur outperformed male teachers at Jam Pur when it came to how much they Digital Informal learning adoption practices.

Table 3
Combined Influence of AI usage and digital informal learning on the functional skills of Islamic school teachers in Southern Pakistan

	Kot addu	Jam Pur	Jalal Pur	Dunya Pur
Male	10.05%	14.13%	06.22%	08.67%
Female	11.24%	19.96%	11.45%	17.77%
Total	21.29%	34.09%	17.67%	26.44%

Based on our findings male teachers in Kot Addu Tehsil made up 10.05% of total while female teachers represented 11.24% but still achieved 21.29% overall in teaching performance. Jam Pur Tehsil reported 14.13% male participation compared to 19.96% female participation but achieved 34.09% total success. Jalal Pur Tehsil had 06.22% male teachers combined with Female participants ranked first in Dunya Pur Tehsil at 17.77% less than Jam Pur Tehsil's 19.96%. In the Kot addu area male teachers outperformed female teachers in our AI usage and digital informal learning on the functional skills.

Discussion

Table 4

Use of digital informal learning tools, video and audio delivering content	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 Internet standards in teaching.	16	72	18	0
I believe that my colleagues use digital tools in ethically responsible ways.	9	58	37	2
AI and Digital informal learning, 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 informal learning tools, trust and Ai usage 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 trust that the digital tools I use 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, X2, and Y gained validation status during the testing process. The nine questions show professionals at Islamic secondary schools their level of digital confidence in AI tools. Our findings are statistically valid because this research includes 450 people who fall within the r table and 0.05 limit. All evaluated variables surpassed the minimum accepted score of 0.1891 during Pearson Correlation testing. Checking the validity of these nine items allows final confirmation. Through my experience I know I can solve small computer issues when using AI in the classroom. I'm comfy using a computer. My teaching with digital resources helps teachers learn better and I am skilled at learning new teaching technology. L. Digital teaching tools make my instruction better.

The research test demonstrates validity and reliability because the Cronbach's alpha scores on digital informal learning and AI usage questions meet or surpass the 0.70 standard. The measurements of digital informal leaning show high reliability with a Cronbach's alpha score of 0.873. Our Ai usage scale shows 0.883 reliability and the Functional skills of Islamic teachers in education scale shows 0.959 reliability according to the reliability testing. All measured variables display strong reliability because their Cronbach's alpha values are above 0.60. The results of our Cronbach's Alpha reliability test for Technology AI Use show 0.917. The variables demonstrate dependable behavior through these test findings. We apply Skewness and Kurtosis to detect if data follows a normal distribution. The Kurtosiis test tracks peaks in distribution data while Skewness measures how skewed the data appears. When skewness and kurtosis values approach zero a data set follows a normal distribution pattern. For Usage of technology and digital informal learning measures the descriptive statistics show skewness ratios of -0.438 and 0.455 while AI usage ratios stand at 0.132 and 0.35. The results indicate our data follows a normal distribution pattern.

The Glejser model uses Abs_RES as its outcome measurement. The results showed X2 digital informal learning showed 15.1% significance while X1 AI usage had 82.6% significance and X3 functional skills displayed 7.7% significance. Our regression model does not show heteroscedasticity because the significance values of all three variables exceed 5% in this examination. The Col-linearity Diagnostics results show Condition Index 46.609 exceeds 30 while Eigenvalue remains below 0.01. Our data analysis reveals multicollinearity is not affecting our results. Abs_RES serves as the model's dependent variable in our test of variance equality through Glejser. These variables scores reached 82.6% while online usage achieved 15.1% and functional skills obtained 7.7% significance. Our data shows 7.7% of teachers met functional skill requirements in the contract. All three tested variables showed significance values above 0.05 which means they did not display heteroscedasticity in the regression model.

Table 5
Descriptive statistics

	N	Range	Min	Max	Means	Std. Deviation	Variances
Digital Informal Learning (X1)	440	5	3	9	6,22	1,470	2.159
AI usage (X2)	440	8	3	10	6.08	1,455	2,120
Functional skills Y)	440	8	3	12	6.57	1,877	3,519
Valid N (listwise)							

According to this table 440 teachers sent their responses. The scale of Digital informal learning runs between 3 for low users up to 9 for advanced users. These results demonstrate that teacher responses to Digital informal learning span the score from 3 to 9. The graph shows that 1.470 standard deviation ranks higher than 6.22 average. AI usage shows great variation in responses based solely on computer measurements. Given that our measurement scale runs from 3 to 10 the results show AI usage numbers between those marks. The data spread is extensive because the standard deviate of 1.455 exceeds its median value of 6.07. Our results show that the Functional Skills scale runs from 3 to 12 points. The data average 6.59 points with 1.876 points of deviation. Our findings show that the values in a digital wallet lie between 6 and 12 points with an average result of 7.26 points and a measurement variation of 1.973 points.

Hypothesis testing

Table 6
t test

Coefficient a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Betas		
1 (constant)					
Digital Informal learning (X1)	1,539	,547		2,949	,003
AI usage (X2)	,657	,335	,468	1,868	,065
Functional skills (Y)	,716	,162	,678	4,123	,000

Experiments show significant relationships between teachers' digital informal learning and AI usage in 0.090 and 0.067 but ethics of technology in 0.000. Our research suggests H1 should be discarded. School administrators in Islamic secondary schools across Kot Addu, Pakistan notice no difference in their Digital informal learning's impact on their usage for technology abilities. Our analysis proves H2 false because 0.090 remains above 0.05. Research findings show that ethical technology growth in Islamic secondary school teachers from kot addu South Pakistan stays unaffected by AI usage. Our evaluation shows that H3 should be supported because 0.000 is lower than our 0.05 threshold. The combination of Digital informal learning and AI usage affects Islamic secondary school teachers' technology stood in kot addu South Pakistan.

4. Recommendations

Technology integration in secondary education for Kot Addu District rural areas depends on teaching programs that teach teachers better digital skills and show how to use AI effectively. Educators need daily learning opportunities to become skilled at working with digital resources. Schools need to protect students' privacy by rigorously following digital tools standards and validating that technology systems meet state rules. Education needs equal access to technology for all students to receive fair opportunities in learning. Students at Islamic schools must benefit from educational technologies that properly fit their faith and traditions.

5. Findings

Results show that teachers in Kot Addu Islamic schools have minimal relationship between their AI usage and their technology and Digital informal learning as well as functional skills (H1 rejected).Research shows Islamic secondary school teachers' Digital informal learning and AI usage levels do not influence their functional skills in the classrooms (H2 rejected).AI in technology directly influences both teachers' Functional skills in technology and their self-confidence in using AI and digital informal learning applications (H3 proved valid).Teachers master digital skills at different rates and feel varying levels of confidence about technology usage which shows professional growth needs customized support.5 (H1 rejected).

Digital Informal learning and AI usage's Influence on functional skills do not have a significant impact on the development of uses of technology among Islamic secondary school teachers, as shown by a significance value of 0.090 > 0.05 (H2 rejected).

Significance of uses of digital tools and AI usage and functional skills significantly among teachers, with a significance value of 0.000 < 0.05 (H3 accepted). Wide Variability in Teacher Responses. The variability in teacher responses regarding digital informal learning, AI usage, and functional skills highlights disparities in skill levels and confidence, emphasizing the need for tailored professional development initiatives.

6. Conclusion

The research findings show technology can boost secondary education capacity in Kot Addu District but academic staff's weak comfort level with technology combined with low usage of digital tools and AI usage, Digital informal learning worries about data safety and cultural practices blocked its smooth integration. AI usage alone fails to boost or decrease secondary school teachers' technology digital informal learning and ethical behavior practices. The impact of digital informal learning and AI usage increases when these elements receive supporting reinforcement strategies. The way technology affects society directly impacts to teachers develop both their AI usage, Digital Informal learning and their skill at using technology. To use technology responsibly in secondary schools the district should build programs that teach students digital skills plus AI usage and Functional skills awareness. Cultural values hindered its effective integration. Limited Impact of AI usage alone does not significantly influence secondary school teachers' trust in technology or their ethical use of it, indicating a need for additional support and training to bridge this gap.

Digital Informal learning and AI usage Require Reinforcement While digital Informal learning and AI usage are essential, their standalone impact on enhancing Functional skills of technology among teachers is limited, suggesting that a more integrated approach is needed to align these factors effectively. usage of Technology as a Key Driver the ethics of technology significantly influence teachers' AI usage and Digital informal learning, underscoring the importance of embedding ethical considerations into technology-related teacher training programs.

Focus on Holistic Development A comprehensive strategy that includes improving digital Informal learning, AI usage, and functional skills awareness is critical for fostering responsible and effective technology use in secondary education, particularly in rural and underserved areas.

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