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The Relationship Between the Primary School Teachers' Attitude Towards Learning AI Technology Usage and Their Professional Development

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Abstract

The integration of Artificial Intelligence (AI) in education has created new opportunities for teachers' professional learning and development. The current study investigated relationship between the primary school teacher's learning AI technology usage and their professional growth. A quantitative survey research design was employed and data were collected from government primary school teachers in District Khushab, Punjab, through a structured questionnaire. Stratified random sampling technique was used to select the respondent of the study from public sector primary schools of tehsil Khushab. Descriptive statistics, correlation and regression analyses were used to analyze the data. The findings revealed the teachers' positive perceptions about AI technology usage for their professional development. AI competency, perceived usefulness, perceived ease of learning and use were found significantly positive correlated with their attitude to learn AI use. The results further showed that teachers' attitude towards learning AI technology usage significantly predicted positively their professional development ($\beta=1.42$, $p < 0.05$). The study concludes that primary school teachers' attitude towards using AI technology positively affect their usage of this technology to enhance their professional development. It is recommended that by providing AI-tools usage trainings, practical learning opportunities, and professional interventional strategies through their CPD programs may accelerate the readiness to use these technologies in their teaching and non-teaching tasks for addressing the future challenges.

Keywords: Artificial Intelligence, Teacher Attitude, Learning AI Technology, Professional Development, Primary School Teachers (PSTs).

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1. Introduction

The rapid integration of technology in different fields has been responsible for the development of Artificial Intelligence (AI) and its effect on education has been growing rapidly, opening new frontiers for teaching and learning. AI is the technology that empowers machines to execute tasks normally done by humans with human intelligence, such as learning, reasoning, problem solving, perception and language understanding (Cantanaro, 2022). AI has played a role in advancing innovations, efficiencies, automation and decision-making in various sectors, including education (Harry, 2023; Yeruva, 2023). The advent of AI in learning brings fresh prospects for enhancing learning experiences and meeting the needs of all learners for teachers.

The use of AI has significant promise to reshape how we teach and learn. AI can be used to create personalized learning experiences, allowing the course to be tailored to each student's interests and needs (Tapalova & Zhiyenbayeva, 2022). AI-powered Chatbots like ChatGPT can also enhance personalized learning, offer individualized feedback, and facilitate self-regulated learning (Tayan et al., 2023). Likewise, AI language tools can benefit pedagogy by offering individualized learning pathways, automated feedback, reflective prompts and knowledge building (Goh & Mahaliza Mansor, 2023). Moreover, AI technologies can help teachers to track student progress, determine strengths and weaknesses and deliver individualized teaching methods. It can also be used to evaluate the performance of the learners and give feedback to the teacher to modify their teaching approach (Aggarwal, 2020; Kumar et al., 2019).

This growing influence of AI in the field of education puts teachers at the core of technological advancements in the classroom. Teachers are key players in students' learning, growth and development, developing inquisitiveness, critical thinking and affection for learning (Mart, 2013). They also encourage and guide children and share the knowledge, skills and resources with them that are needed to succeed (Arianti, 2019). In addition, teachers are mentors, role models and have a significant role in the character building and social and emotional health of their students (Careemdeen, 2023). Teachers have to continuously develop their professional knowledge and skills in relation to these responsibilities. It is important for teachers to continuously improve their professionalism and stay updated with the latest educational studies, methods, and practices (Riadi et al., 2022). As a result, AI places another demand on teachers to learn and cultivate new skills in the realm of technology. In the case of primary school teachers, AI can help with preparing materials, designing activities and assessments and adjusting the approaches to teaching to meet the varying needs of students. It can also facilitate personalized learning, automated assessment and intelligent tutoring (Mallik & Gangopadhyay, 2023). Furthermore, AI can be used for active and interactive learning, and to offer opportunities for more meaningful learning experiences (Grassini, 2023). But to realize such potential, teachers need to become familiar with AI and acquire the ability and eagerness to incorporate it into their professional work.

Teachers however, have their challenges with the integration of AI. The lack of access to technology and the digital divide may hinder teachers' ability to effectively influence AI (Sharifuddin & Hashim, 2024). Moreover, teachers' readiness and willingness to adapt to new technologies are crucial for successful classroom integration (K. Kim & Kwon, 2023). There is a need for teachers to be trained to effectively use the AI tools and to teach students how to think critically and ethically about the use of AI (Y. Chen & Zou, 2024). Other difficulties involve a lack of technical expertise, limited access to software, hardware and the Internet, privacy concerns and ethical issues. There is also the perception on the part of some teachers that AI is not convenient (Tao et al., 2019) and that AI technology will one day take the place of their jobs.

Teacher professional development is related to enhancing teacher academic eminence, competence, effectiveness, knowledge and skills, as well as teachers' professional practices. Teacher Professional Development (TPD) refers to the process of improving the academic quality of teachers so as to boost their capability and efficacy in handling their work (Komba & Nkumbi, 2008). It also relies on teachers' ability to apply knowledge, experience, skills and technology to enhance teaching and learning outcomes and the professionalism of the educational staff (Zainal & Elham, 2007). Moreover, the activities of TPD involve the promotion of teachers' professional career development and equipping of the teachers with abilities and attitudes in order to face the problems in twenty first century education (Sprott, 2019). Professional learning is also a part of the 21st century's requirements for education. TPD includes activities that encourage professional growth and development and have the capacity to equip teachers with the skills and attitudes necessary to meet current challenges in education (Sprott, 2019). The teachers can attend seminars, workshops, professional associations, e-learning and informal peer discussions (Eksi & Aydın, 2013). These activities enable teachers to explore new methodologies, assessment strategies and technology integration approaches. Online professional development also offers opportunities for teachers to learn and develop at their own speed and share and exchange resources with other teachers (Borup & Evmenova, 2019).

Teachers can engage in professional development in various ways such as through a seminar, workshop, professional associations, individual online learning and informal discussion with peers (Eksi & Aydın, 2013). These activities can be an opportunity for learning new teaching methods, assessment techniques and ways to integrate technology into teaching. Academic forums on the internet can also be used by instructors to increase their information and abilities at a pace and accessibility of their own and at the same time connect, collaborate and share experiences and resources with other teachers (Borup & Evmenova, 2019). Furthermore, online professional development is also considered an important method of delivering accessible professional development to teachers (Bragg, Walsh et al., 2021).

2. Literature Review

Artificial Intelligence has been making features in the educational sector due to its capacity to assist in learning and teaching processes. AI is capable of tasks related to human intelligence and it can be used for learning, reasoning, problem solving, perception and understanding language (Cantanaro, 2022). In the educational sector, AI technology has been leveraged to assist teachers in tracking student learning, personalizing learning experiences, providing instructional support and providing feedback on student performance (Aggarwal, 2020; Kumar et al., 2019).

AI can offer personalized learning, one of its key contributions. AI can enable personalized teaching based on students' interests, which can lead to more individually tailored and engaging learning experiences (Tapalova & Zhiyenbayeva, 2022). AI Chatbots like ChatGPT can also provide personalized feedback and support for self-regulated learning, improving learning and engagement (Tayan et al., 2023). Similarly, AI technologies in language learning can facilitate individual learning courses, automated assessment of learner performance, self-reflection and self-questioning and collaborative knowledge construction (Goh & Mahaliza Mansor, 2023). These applications indicate that AI can provide teachers with additional means of responding to individual differences among learners.

While AI offers opportunities for teachers, its incorporation presents some challenges. To use AI, teachers might be constrained by the digital divide and lack of access to technology (Sharifuddin & Hashim, 2024). It is also essential for teachers to be ready for new technology and to be willing

to make use of it for classroom integration (K. Kim & Kwon, 2023). However, teachers might face challenges when using AI effectively and supporting students in developing critical and ethical practices in the use of AI (Y. Chen & Zou, 2024).

Lack of technical knowledge and limited access to software, hardware and internet facilities are also hurdles in the way of AI adoption. Some teachers might be worried about privacy or ethical issues, while others might find AI tools to be cumbersome or think that it may become a threat to their employment in the future (Tao et al., 2019). It is therefore especially relevant to have to train teachers. Teachers should be familiar with and have the tools necessary to effectively use AI technologies (Vlasova et al., 2019; Nazaretsky et al., 2022).

Zainal & Elham (2007) describe that TPD is the application of knowledge, experience, skills and technology by teachers to enhance teaching and learning results and their professional practice. Similarly, Djatmiko (2016) points out that the concept of professional development is determined by the needs and responsibilities of teachers in developing their careers. The professional development of teachers should include opportunities for teachers to take control of their learning, deepen their subject matter knowledge, build on prior knowledge, and establish professional relationships with fellow teachers (Bransford, Brown, & Cocking, 2000; Knowles, Holton, & Swanson, 2005). Professional development should also be considered in terms of how it impacts teacher behavior and student learning outcomes (Guskey, 2000). School reform implementation requires the support and resources of teachers to gain expertise in different practices (Hawley & Sykes, 2007). This support can take the form of ample time to learn, explicit directions and learning goals, timely feedback, opportunities to witness and practice new skills, and cultures that embrace inquiry, risk-taking and problem solving (Barth, 2007; Elmore, 2007; Guskey, 2002).

To incorporate AI, teachers must build their digital competencies and learn how to use AI in education. Teachers, however, might face challenges with technological proficiency, resource limitations, privacy concerns, ethical concerns and doubts about AI. Training, digital competence and teachers' attitude to learn AI are therefore mentioned in the literature as key aspects (Vlasova et al., 2019; Polak et al., 2022). Attitude of teachers is, therefore, significant as learning and using AI involves engagement with new knowledge and practices.

Artificial Intelligence (AI) is being integrated into education more and more, providing new avenues for teachers to improve their skills. However, primary school teachers may differ in their attitudes and willingness to learn and use AI technology, which can influence their professional growth and development. In particular, limited understanding of teachers' attitudes toward learning AI and their relationship with professional development may hinder efforts to provide appropriate training and support. Therefore, there is a need to empirically examine the relationship between primary school teachers' attitudes toward learning AI technology and their professional development. Therefore, this study was aimed 1) To examine the factors that influence primary school teachers' attitude towards learning and adopting AI technology. 2) To identify the challenges faced by primary school teachers in integrating AI technology into their professional development. 3) To explore innovative strategies and practices that can support teachers in using AI for teaching and professional growth.

3. Methodology

This study was conducted by adopting a quantitative method with descriptive survey design. The target population were the public primary school teachers of Tehsil Khushab, District Khushab, Punjab. The data was obtained from the official data of the school census records which showed

that there were 1,302 primary school teachers in 204 public primary schools in Tehsil Khushab <https://sis.pesrp.edu.pk/>. Out of the 204 schools, 25 schools were selected as the sample through stratified random sampling technique. At the next stage, census sampling was used to select the primary school teachers from these primary schools. Total, 200 primary school teachers were the final respondents of this study. The research instrument was developed by reviewing the relevant literatures of available scales and in consultation with the research supervisor. The questionnaire consisted of six scale to measure the AI Tool Competency (ATC), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Interest/Affect towards Learning AI (ATT), and Behavioral Intention (BI), as well as professional development, which were guided by the Technology Acceptance Model (TAM) proposed by Davis (1989) and a scale to measure their perceived professional development. The questionnaire was having two parts, first part contained demographic questions to collect the demographic profile of the respondents, while the second part was comprised of 42 statements measured on a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Data was gathered by the researcher herself.

4. Results

The collected data was analyzed by using SPSS v.27. The table 1 presents the demographic profile of the respondents of this study.

Table 1: *Demographic Profile of the Primary School Teachers*

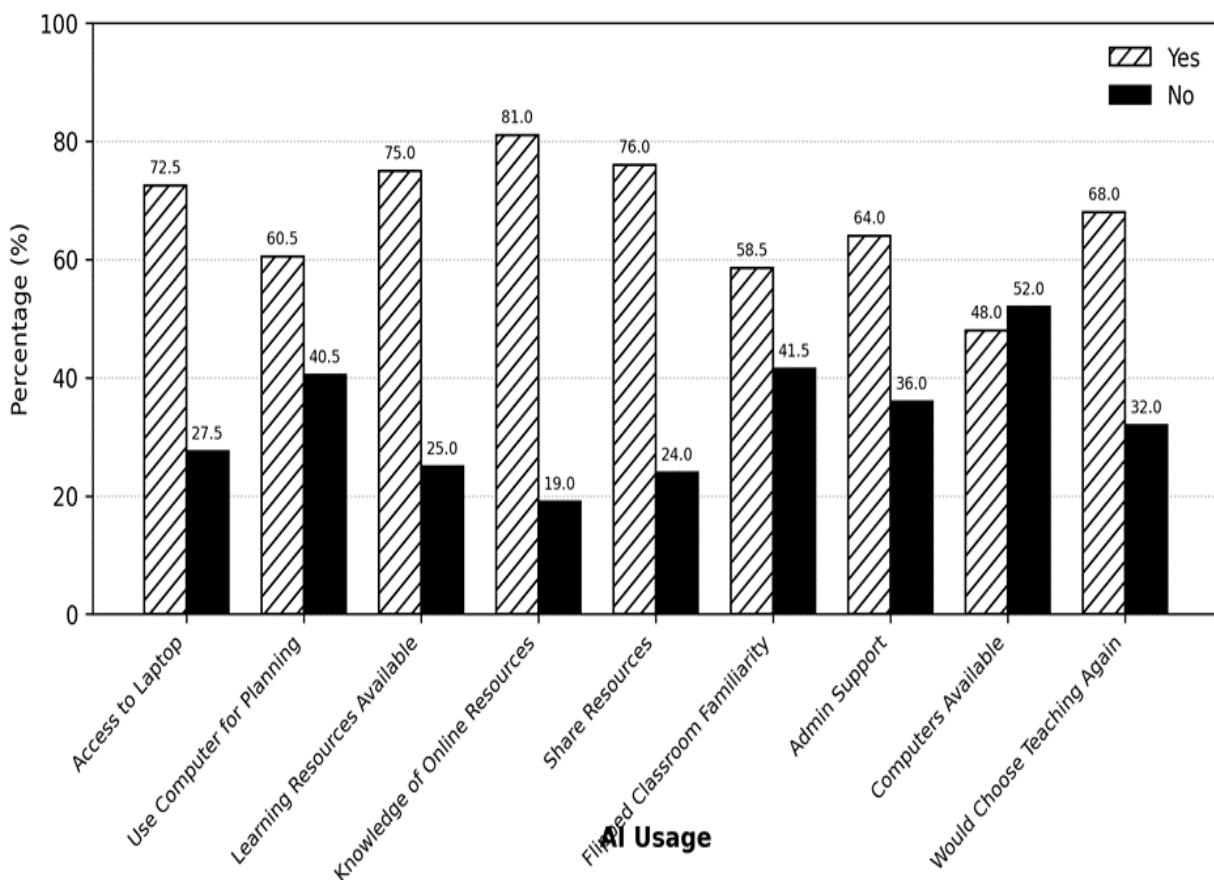
Variable	Category	Frequency	Percentage (%)
Gender	Male	69	34.5
	Female	131	65.5
Age	20-30 years	47	23.5
	31-40 years	82	41.0
	41-50 years	41	20.5
	50 years and above	30	15.0
Area	Urban	137	68.5
	Rural	63	31.5
Academic Qualification	BA/BS	66	33.0
	MA/MS	98	49.0
	MPhil	35	17.5
	PHD	1	0.5
Work Experience	1-5 years	27	13.5
	6-10 years	77	38.5
	11-15 years	33	16.5
	16+ years	63	31.5

The demographic characteristics of the 200 primary school teachers in the study are given in Table 1. The sample consisted of 69 male teachers (34.5%) and 131 female teachers (65.5%), indicating greater representation of female teachers. Regarding age, the largest group was between 31 and 40 years (41.0%), followed by teachers aged 20–30 years (23.5%), 41–50 years (20.5%), and 50 years or above (15.0%). Overall, 64.5% of the participants were below 40 years of age, suggesting that

the sample was predominantly composed of relatively young and professionally active teachers. As far as locality is concerned, majority of respondents were from urban areas (68.5%) and 31.5% from rural areas. Academic qualifications of the teachers showed that nearly half of the teachers held an MA/MS degree (49.0%) and 33.0% had a BA/BS qualification. A further 17.5% possessed an MPhil degree, whereas only 0.5% held a PhD. This indicates that the sample was generally well educated, although teachers with doctoral qualifications were minimally represented. The distribution of work experience shows that the largest proportion of teachers had 6–10 years of experience (38.5%), followed by those with 16 or more years of experience (31.5%). Teachers with 11–15 years of experience represented 16.5% of the sample, while 13.5% had 1–5 years of experience. Thus, 86.5% of the participants had more than five years of teaching experience, indicating that most respondents had sufficient professional exposure to provide informed opinions about learning AI technology and professional development. The sample consisted of a diverse range of teachers across demographic and professional characteristics. This diversity provides a useful basis for examining teachers' attitudes toward learning AI technology and their professional development. The relative over-representation of female and urban teachers, however, should be taken into consideration when interpreting the findings and the generalizability of results. The table is to provide information about the sample composition only and is not intended to denote any relationships or causal effects between the study variables.

Further, to measure the usage of technology and AI tools, questions were asked and presented a graphical representation of the responses in the figure 1 below.

Figure 1. *Graphical Representation of the AI usage*



The bar graph below shows the responses of the primary school teachers to the questions 11 to 19 about the use of AI and related technology practices. The results show that the majority of teachers reported that they have received laptops (72.5%), learning resources (75.0%), information about online resources (81.0%) and sharing educational resources (76.0%). Furthermore, 60.5% of teachers indicated that they used computers for lesson planning and 58.5% of teachers knew the principles of the Flipped classroom. As far as administrative support, 64.0% of teachers noted that they were supported by their administration. 48.0% reported that they had computers in their school while 52.0% reported they did not have computers in their school. The findings indicate that, overall, teachers' access to digital learning resources and online information is relatively high, while schools' computer access is rather low.

Table 2: Mean, Standard Deviation and correlation coefficients between the variables

Variables	N	M	SD	1	2	3	4	5	6	7	8
1. ATC	200	3.70	0.939	—							
		125									
2. PU	200	3.93	1.035	.725**	—						
		625	4875	*							
3. PEOU	200	3.75	0.925	.703**	.732*	—					
		625	435	*	**						
4. ATT	200	3.93	0.921	.622**	.738*	.761*	—				
		125	865	*	**	**					
5. BI	200	3.79	0.940	.608**	.628*	.667*	.687*	—			
			92	*	**	**	**				
6. PE	200	3.74	0.944	.677**	.702*	.750*	.780*	.667*	—		
		5	4225	*	**	**	**	**			
7. PD	200	8.82	1.907	.716**	.773*	.778*	.824*	.732*	.922*	—	
		5833	5	*	**	**	**	**	**		
		33									
8. PDSC	200	3.89	0.818	.600**	.676*	.615*	.677*	.646*	.706*	.860*	—
		5	8125	*	**	**	**	**	**	**	

Note. ** $p < .01$ & *** $p < .001$

The results of correlation analysis show that all the variables of the study were having significant and positive correlation with each other. The range of the Pearson's coefficients of correlation were between $r = .385$ and $r = .922$, which represents moderate to very strong relationships. Perceived Usefulness ($r = .725^{***}$), Perceived Ease of Learning/Use ($r = .703^{***}$), Interest toward Learning AI ($r = .622^{***}$), and Behavioral Intention ($r = .608^{***}$) were all significantly and positively correlated with AI Tool Competency. Likewise, Behavioral Intention was having significant positive correlation with Perceived Usefulness ($r = .628^{***}$), Perceived Ease of

Learning/Use, and Interest and Positive Affect positively correlated with and were found to be, $r = .667^{***}$, and $r = .687^{***}$, respectively. These findings indicate that the teachers who perceived higher competency with AI and more positive attitudes towards AI had stronger intentions for learning and using AI technology. In addition, the professional development variables also had significantly positive correlations with the variables related to AI. Professional Engagement was found to be significantly correlated with PD Effectiveness ($r = .922^{***}$) and PD Supportive Context ($r = .706^{***}$); PD Effectiveness was strongly correlated with PD Supportive Context ($r = .860^{***}$). The highest correlation coefficient was found between Professional Engagement and PD Effectiveness ($r = .922$, $p < .01$), suggesting a very strong positive relationship between these dimensions of PD. Hence these results showed that positive competencies, perceptions, interest, and intentions around AI are significantly related to teachers' professional engagement and professional development overall.

Regression Analysis

A multiple regression analysis was computed to measure the perceived professional development predicted through the variables AI Tool Competency (ATC), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Interest/Affect towards Learning AI (ATT), and Behavioral Intention (BI). The ANOVA results showed that this model of predicting professional development on bases of these predictors significantly exist ($F = 146.036$, $p < .001$). Further, the model summary showed that there exists moderately strong relationship between the predictors and the dependent variable ($R = .889$). In addition, R^2 indicates proportion of variance in the dependent variable explained by the independent variables. Here, R^2 value (.79) shows that 79.0% of the variance in the professional development was explained by the five predictors in the model.

Table 3: *Regression Analysis Results*

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.788	1.797		3.222	.001
AI Tool Competency (ATC)	.515	.158	.170	3.267	.001
Perceived Usefulness (PU)	.447	.159	.163	2.820	.005
Perceived Ease of Use (PEOU)	.413	.181	.135	2.278	.024
Attitude Toward Learning AI (ATT)	1.139	.179	.370	6.355	.000
Behavioral Intention (BI)	1.094	.294	.181	3.716	.000

Results presented in table 3 indicate that five prediction factors are able to significantly and positively predict the variables Professional Development for primary school teachers. AI Tool Competency (ATC) had a significant positive effect on Professional Development ($B = .515$, $\beta = .170$, $t = 3.267$, $p = .001$). The results show that the competency in AI tools is correlated with the level of professional development. Likewise, Professional Development ($B = .447$, $\beta = .163$, $t = 2.820$, $p = .005$) was strongly associated with Perceived Usefulness, and teachers who perceive AI tools as being more useful report more professional development. Perceived Ease of Learning/Use (PEOU) also had a significant positive contribution ($B = .413$, $\beta = .135$, $t = 2.278$, $p = .024$).

Interest and Positive Affect toward Learning AI (ATT) was the most powerful predictor of Professional Development ($B = 1.139$, $\beta = .370$, $t = 6.355$, $p < .001$). This indicates that the positive attitudes, enjoyment, and interest of the teachers in the learning of AI is a significant factor in explaining their professional development. Finally, Behavioral Intention (BI) also significantly and positively predicted Professional Development ($B = 1.094$, $\beta = .181$, $t = 3.716$, $p < .001$). In general, the results indicate that all AI tool competency, perceived usefulness, perceived ease of learning/ease of use, interest and positive affect, and behavioral intention positively influence teachers' professional development. Of these predictors, the relative contribution was greatest for Interest & Positive Affect toward Learning AI (ATT), having the highest standardized beta coefficient ($\beta = .370$).

5. Discussion

The present study examined the influence of primary school teachers' attitude towards learning AI technology on their professional development. The results suggest that teachers' perceptions of AI technology are mostly positive, encompassing AI competency, perceived usefulness, ease of use and positive interest in learning AI. Teachers also showed positive intentions to learn and utilize the AI technology. The results are in line with the literature, highlighting the increasing role of AI in the education sector and how it can be used to assist in preparing content, assessment, personalized learning, instructional activities, and the professional practices of teachers (Tapalova & Zhiyenbayeva, 2022; Mallik & Gangopadhyay, 2023; Grassini, 2023). The results thus indicate that teachers are aware of the potential of AI as a new educational tool.

The literature also supports the positive relationships between the constructs: behavioral intention and interest/positive affect, perceived ease of learning/use and interest/positive affect and perceived usefulness and interest/positive affect. In order to effectively apply AI applications, teachers must be inspired, have digital competence and be prepared to change, as mentioned by Polak et al. (2022) and K. Kim and Kwon (2023). Likewise, Vlasova et al. (2019) and Nazaretsky et al. (2022) highlight the need for skills and technology training. The present results then indicate that the confidence, positive perception and desire to learn of teachers are key aspects of their relationship with AI technology.

The results also indicate positive professional learning experiences such as professional engagement, effectiveness and a supportive context. This result is similar to what has been documented in the literature which states that professional development is a continuous process that enables teachers to increase their knowledge, skills, competence and professional effectiveness (Komba & Nkumbi, 2008; Zainal & Elham, 2007). Professional development is also considered to be related to other dimensions of the process and the relationships among the dimensions are found to be strong (Guskey, 2000; Hawley & Sykes, 2007; Darling-Hammond et al., 2009; Desimone, 2009).

Most notably, the study results show that teachers' attitude for the study of AI technology has a strong influence on their professional development. The finding is highly congruent with the review of literature done in the study. Shulman and Shulman (2009) state that attitude to learn is a prerequisite of effective professional development, and Alam et al. (2020) argue that teachers' attitude to improve leads them in their professional development and learning to enhance their teaching and learning outcomes. The results of challenges and AI ethics are also in line with the literature, as access to technology, knowledge of technology, privacy, ethical issues and preparedness are cited as key challenges in the scope of AI integration (Sharifuddin & Hashim, 2024; Y. Chen & Zou, 2024; Tao et al., 2019). These elements demonstrate that the teachers'

consciousness of these needs should be complemented by proper training and guidance to ensure the responsible and effective use of AI.

In summary, the results confirm the main argument of the study that the attitude to learn the AI technology is a significant element in the process of teacher professional development. The findings are consistent with the literature discussed in this study in that they highlight the links between attitude, digital competence, positive perceptions, training and supportive professional contexts and teachers' ongoing professional development. Therefore, boosting teachers' attitude in learning AI, along with suitable professional development programs and institutional support, can be helpful to their preparedness to meet the technological needs of modern primary education.

6. Conclusion

The present study concludes that primary school teachers' attitude towards learning AI technology has a significant positive influence on their professional development. The results indicate that the teachers' perceptions of AI technology are largely positive and that intentions to use AI are positively related to AI competency, perceived usefulness, perceived ease of use and positive interest in AI. The study also finds that attitude for the study of AI technology is a strong determinant of teachers' professional development.

The results support the findings of literature that teacher's attitude is regarded as an important basis for the process of continuous professional development. In an era where AI is shaping the future of education, teachers must have access to AI tools and the inspiration, digital skills, training and support structures to utilize it effectively and responsibly.

Thus, professional development for primary teachers must include opportunities for learning about AI, building skills in AI, working with others and awareness of ethical issues. Enhancing teachers' passion for learning AI will help to enhance their professional skills and lifelong learning, and meet the evolving needs of technology-integrated teaching. In summary, the research emphasizes that attitude for learning AI technology is a crucial aspect of modern teachers' professional development.

7. Recommendations

Based on the results of this study, the following recommendations are made:

National education authorities can incorporate comprehensive programs on the use of AI in primary education in the professional development of primary school teachers. Ongoing training programs, with proper resources, digital infrastructure and ethical frameworks can help build the capacity of teachers to use AI in education and teaching. Well-designed and supported AI training programs, along with adequate resources, digital infrastructure and ethical guidelines can help improve teachers' capacity to use AI in education and teaching. School leaders have the opportunity to create professional learning communities, peer mentoring and hands-on learning opportunities to encourage positive attitudes to AI technology. These programs can improve teachers' confidence, skills and ability to effectively influence AI in the classroom. Hands-on workshops and courses can allow teachers to learn and practice the use of AI tools for teaching. Purchasing digital devices such as computers and tablets, as well as enhancing internet connections, can contribute to the digital competence of the educator and provide a conducive environment for the use of AI in education. A national policy on AI for primary education could encourage the responsible, safe and ethical implementation of AI tools in the school context. Larger, more varied samples throughout different regions and in different educational contexts

may be included in future research. Incorporating students' perspectives may also provide a broader understanding of AI integration in primary education.

Conflict of Interest

The authors showed no conflict of interest.

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