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Artificial Intelligence Integration in Teacher Professional Development: A Buddhist Education Perspective in Paschim Bardhaman, India

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ABSTRACT

This study examines the role of Artificial Intelligence (AI) in Teacher Professional Development (TPD) by analyzing teachers' awareness, usage patterns, perceived benefits, and challenges in integrating AI into professional learning processes. The research aims to provide updated empirical insight into how AI enhances teacher growth, particularly in regions where technological adoption is still developing. A descriptive quantitative method was employed using structured survey questionnaires administered to in-service teachers in Paschim Bardhaman District, West Bengal, India. The data were analyzed through descriptive statistics to identify levels of awareness and common perceptions regarding AI-based tools in TPD. The findings reveal that teachers show high awareness and positive attitudes toward AI, recognizing its potential to support personalized learning, improve instructional efficiency, and facilitate pedagogical reflection. However, actual implementation remains limited due to insufficient training, data privacy concerns, and uneven digital infrastructure. The study's implications emphasize the need for stronger institutional support through continuous capacity-building, ethical guidelines, and equitable access to AI technologies. Such support is essential to ensure that AI can be implemented responsibly and effectively within teacher development systems. The originality of this study lies in integrating Buddhist ethical principles—sammā-diṭṭhi, sīla, and majjhima paṭipadā—as a normative framework to guide balanced and ethical AI adoption in education. This approach provides a unique moral-technology alignment that distinguishes the study from previous research.

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Introduction

The rapid advancement of digital technology over the past two decades has brought profound changes to nearly every sector of life, including education. This transformation is evident in UNESCO data (2023), which indicate that more than 89% of countries worldwide have integrated digital technologies into learning processes through online platforms, adaptive learning systems, and Artificial Intelligence (AI)-based tools. At the practical level, a RAND Corporation survey (2025) reports that the number of school districts in the United States providing AI training for teachers rose sharply from 23% in 2023 to 48% in 2024 and is projected to reach 74% by 2025. These developments demonstrate that Teacher Professional Development (TPD) has become increasingly essential in response to a learning ecosystem that is growing more digitalized.

However, the increasing use of technology does not necessarily correspond with teachers' level of readiness. The Microsoft *AI in Education* report (2025) highlights that although 86% of educational institutions globally have adopted AI technologies, approximately 45% of teachers state that they have never received formal training related to AI use, whether for teaching or for professional development. This disparity signals a digital competence gap and underscores the urgent need for relevant, systematic, and accessible training for educators from diverse backgrounds. Without adequate support, this gap may create new inequalities in teaching quality, especially as teachers struggle to adapt to rapid technological developments, including AI.

In the context of Buddhist education, these challenges take on a more complex meaning. Teachers in Buddhist institutions serve not only as transmitters of knowledge but also as moral and spiritual figures who embody Buddhist values such as *sīla* (ethics), *samādhi* (concentration), and *paññā* (wisdom). The transition toward digital learning requires teachers not only to understand technological tools but also to ensure that AI integration remains aligned with the humanistic, compassionate, mindful, and self-reflective principles that ground Buddhist education. This raises important questions regarding the readiness of Buddhist educators to use AI as part of their professional development and the extent to which the technology can be integrated without displacing the core values that characterize Buddhist pedagogy.

The literature shows that research on AI use in education has developed along several major trajectories. First, many studies focus on the role of AI in enhancing student learning through adaptive tutoring, learning analytics, and automated feedback (Chen, Xie, Zou, & Hwang, 2020; Luckin, Holmes, Griffiths, & Forcier, 2016). While significant, these studies tend to prioritize student outcomes rather than teachers' professional development. Second, some studies examine how AI can improve administrative efficiency and classroom management, such as automated assessment or learning performance analytics (Zawacki-Richter, Marín,

Bond, & Gouverneur, 2019). However, these studies rarely address how AI can sustainably strengthen teachers' professional capacities. Third, research exploring ethical issues, algorithmic bias, and digital access inequalities has begun to emerge (Williamson & Eynon, 2020), yet very few studies link these issues to value-based or spiritual educational contexts, including Buddhist education.

These gaps reveal an important research opportunity that has not been adequately addressed. Very few studies specifically examine how AI is used in teacher professional development within Buddhist educational settings, which hold distinctive pedagogical characteristics and strong spiritual foundations. No existing research explores Buddhist teachers' perceptions, readiness, experiences, and challenges in using AI to enhance both pedagogical competence and spiritual quality. This gap forms the basis for the present study.

Accordingly, this research aims to comprehensively analyze the awareness, experiences, and readiness of teachers in Buddhist educational institutions regarding AI use in their professional development. It also seeks to identify the forms of AI utilization already practiced, the benefits perceived, the challenges encountered, and strategies for implementing AI in ways that align with Buddhist values to support sustainable professional growth.

Argumentatively, this study proceeds from the view that AI holds significant potential to enhance teachers' effectiveness, deepen pedagogical reflection, and strengthen professional competence—including within Buddhist education—provided that its implementation aligns with the ethical, mindful, compassionate, and wisdom-based principles central to Buddhist teachings. However, such potential does not materialize automatically without adequate technical readiness, digital literacy, and institutional support. Therefore, the study assumes that teachers' understanding and readiness influence their ability to use AI effectively within TPD. Furthermore, it posits that alignment between AI use and Buddhist educational values does not necessarily increase acceptance directly but rather functions as an ethical framework that enables teachers—especially in Buddhist institutions—to adopt AI selectively, mindfully, and in a balanced manner so that its use remains optimal without displacing the humanistic principles fundamental to Buddhist education.

Method

This study focuses on in-service teachers in Buddhist educational institutions, public schools, and higher education institutions in the Paschim Bardhaman District, West Bengal, India, as its unit of analysis. These teachers were selected because they directly interact with educational technologies and are likely to experience the impact of integrating Artificial Intelligence (AI) into their professional development. The unit of analysis includes teachers across multiple

educational levels—elementary, lower secondary, upper secondary, and tertiary education—and represents diverse subject areas such as Science, Mathematics, Social Sciences, Languages, and Commerce. Their varied ages, teaching experience, and digital literacy levels offer a holistic picture of teachers' readiness to utilize AI in the region.

The study employed a descriptive survey design using a mixed-methods approach that combines quantitative and qualitative methods (Creswell & Creswell, 2017; Maxwell, 2008). This approach was chosen because it allows for a broad examination of teachers' usage patterns, awareness levels, and perceptions of AI while also capturing the depth of their experiences and challenges through qualitative insights. Mixed-methods research is particularly suitable for investigating complex and multidimensional phenomena such as AI integration in teacher professional development, as it draws on the strengths of numerical data and reflective, contextual narratives.

The data for this study consisted of two primary sources: quantitative survey data and supplementary qualitative data. The primary data were collected through questionnaires completed by approximately 200–300 teachers from government, private, and Buddhist educational institutions. These institutions included Burdwan University Model School, Kendriya Vidyalaya Asansol, St. Patrick's Higher Secondary School, Bidhan Chandra Institution, Burdwan Municipal High School, and Aurobindo Vidyamandir (Durgapur). The qualitative data were obtained from semi-structured interviews with 10–15 purposively selected teachers to deepen the understanding of their experiences, challenges, and interpretations of AI use in professional development.

Data collection involved two main techniques: questionnaires and interviews. The questionnaires were distributed through digital platforms such as Google Forms or Qualtrics and contained Likert-scale items, multiple-choice questions, and open-ended responses designed to assess teachers' awareness, usage experiences, perceived benefits, and challenges in adopting AI. The semi-structured interviews were conducted online or in person using an interview guide that enabled exploration of psychological, pedagogical, and Buddhist value-based considerations that influence teachers' acceptance of technology. This combination of techniques ensured that the data captured both the breadth of response patterns and the depth of individual experiences.

Data analysis followed two approaches aligned with the nature of the data collected. Quantitative data were analyzed using descriptive statistics such as frequencies, percentages, and mean scores, and were further examined using inferential tests such as t-tests and ANOVA through SPSS or Microsoft Excel. These analyses aimed to identify significant differences based on variables such as age, teaching experience, or levels of digital literacy. Meanwhile, qualitative data from interviews were analyzed using thematic analysis to identify recurring patterns, key

themes, and essential narratives emerging from teachers' experiences with AI in their professional development. All research procedures adhered to ethical standards, including informed consent, confidentiality, and the protection of respondents' personal data in accordance with institutional guidelines.

Result

Teachers' Awareness, Experiences, and Readiness in Using AI for TPD

This section presents quantitative findings on teachers' levels of awareness, experiences, and readiness in utilizing Artificial Intelligence (AI) for professional development. A total of 245 teachers from various educational levels participated in the survey. Four key indicators were analyzed: (1) familiarity with AI, (2) experiences and formal training related to AI, (3) understanding of AI's role in Teacher Professional Development (TPD), and (4) perceptions of AI's relevance to teaching roles. The core findings of the survey are presented in Table 1.

Table 1. Distribution of Teachers' Awareness, Experiences, and Readiness Toward AI (n = 245)

Assessment Indicator	Response Category	Number (n)	Percentage (%)
Familiarity with AI (Scale 1–5)	Not familiar at all (1)	18	7.3%
	Not very familiar (2)	75	30.6%
	Moderate (3)	92	37.6%
	Quite familiar (4)	43	17.6%
	Very familiar (5)	17	6.9%
AI Training Status	Have attended	69	28.2%
	Plan to attend	128	52.2%
	Never attended	48	19.6%
Understanding of AI's role in TPD (Scale 1–5)	Do not understand (1)	16	6.5%
	Low understanding (2)	87	35.5%
	Moderate understanding (3)	68	27.8%
	Fairly good understanding (4)	54	22.0%
	Good understanding (5)	20	8.2%

Perceived relevance of AI to teaching (Scale 1–5)	Not relevant (1)	9	3.6%
	Slightly relevant (2)	55	22.4%
	Moderately relevant (3)	90	36.7%
	Quite relevant (4)	61	24.9%
	Very relevant (5)	30	12.2%

The data in Table 1 show that teachers' awareness of AI falls within the moderate-to-high category. More than half of respondents (62%) indicated that they were moderately to fairly familiar with AI concepts, suggesting that AI is no longer unfamiliar to most teachers. However, this level of familiarity does not necessarily correspond with substantial hands-on experience in using AI for TPD. Although AI has gained popularity, formal training remains limited. Only 28.2% of teachers reported having attended workshops or courses on AI, while 52.2% expressed an intention to participate in future training. This reflects a strong need for digital capacity-building. Meanwhile, 19.6% of teachers had never attended any training and had no plans to do so, indicating potential digital disparities among teacher groups.

Regarding understanding of AI's role in TPD, 58% of respondents reported moderate to good understanding of how AI can support pedagogical reflection, lesson-plan development, instructional design, and the evaluation of teaching performance. However, the remaining 42% still demonstrated low levels of understanding, highlighting the need for improved digital literacy. Teachers' perceptions of AI's relevance to their professional roles were also positive. A total of 74% viewed AI as relevant or highly relevant, particularly in preparing instructional materials, evaluating student work, and increasing administrative efficiency (Mondal & Das, 2023).

These quantitative trends are reinforced by interview findings. One teacher noted that AI helps them reflect on teaching processes more efficiently, especially when identifying weaknesses in lesson plans and instructional materials (G., junior high school teacher, 6 years of experience, interview conducted June 2024). This indicates that although formal training is uneven, informal use of AI has begun to emerge among teachers. In addition to the main indicators, the study assessed several supplementary variables, including the types of AI applications teachers had used, their self-efficacy levels, readiness across age groups, and access to digital devices. These variables provide a more comprehensive picture of AI adoption readiness.

Table 2. Types of AI Applications Teachers Have Used

AI Application Type	Have Used (%)	Have Not Used (%)
ChatGPT / OpenAI tools	48%	52%
Google Bard / Gemini	31%	69%
AI-based LMS tools (Edmodo AI, Moodle AI)	22%	78%
AI for automated assessment	17%	83%
AI for developing instructional materials	35%	65%

The data indicate that ChatGPT is the most widely used AI application (48%), followed by AI tools for preparing teaching materials (35%). Meanwhile, the use of AI for automated assessment remains very low (17%), suggesting that teachers remain cautious about employing AI for formal evaluation tasks.

Table 3. Levels of Teacher Self-Efficacy

Self-Efficacy Level	Number of Teachers	Percentage (%)
Very low	21	8.6%
Low	67	27.3%
Moderate	102	41.6%
High	42	17.1%
Very high	13	5.3%

Most teachers reported a moderate level of self-efficacy (41.6%), followed by those with low self-efficacy (27.3%). Only 22.4% demonstrated high or very high self-efficacy. This suggests that confidence remains a key variable limiting AI adoption.

Table 4. AI Adoption Readiness by Age Group

Age Group	Ready / Fairly Ready (%)	Not Ready (%)
< 30 years	71%	29%
31–40 years	63%	37%
41–50 years	49%	51%
> 50 years	33%	67%

The age-based data reveal a clear pattern: younger teachers are more ready to adopt AI, while teachers over age 50 show the lowest readiness (33%). This has implications for designing differentiated training strategies tailored to each age group.

Table 5. Access to Digital Devices Supporting AI Use

Technology Access	Yes (%)	No (%)
Personal laptop	84%	16%
High-capacity smartphone	92%	8%
Stable internet	61%	39%
Access to online training	54%	46%

Although most teachers possessed adequate personal devices, only 61% reported stable internet access. This represents a significant structural barrier to AI adoption, particularly in schools with weaker infrastructure. The data indicate that teachers in Paschim Bardhaman possess relatively high levels of awareness regarding artificial intelligence, as reflected in the fact that most respondents fall within the moderate-to-high familiarity categories. However, this level of awareness has not yet translated into consistent AI use, as many teachers have never participated in formal training and continue to rely primarily on self-exploration through basic applications such as ChatGPT. Nevertheless, teachers perceive AI as relevant to their pedagogical responsibilities, and most express a strong interest in learning and utilizing AI more extensively. In other words, teachers currently occupy a position of being conceptually ready but not technically prepared, which highlights the need for stronger training support and improved infrastructural access to enable optimal integration of AI in TPD (Mondal, Singh, & Kar, 2021).

Based on the quantitative and qualitative data presented, four major patterns characterize the dynamics of teachers' awareness, experiences, and readiness in using AI for professional development. First, teachers exhibit high levels of awareness, but their actual use of AI remains low. Although more than half of respondents reported moderate to high familiarity, their practical use of AI is still very limited. This is evident from the low rates of adoption of AI-based LMS tools and AI-driven automated assessment, as well as the fact that only 28% of respondents have ever attended formal AI training. These findings reveal a gap between conceptual knowledge and practical application, making structured training and mentoring essential.

Second, AI adoption readiness is significantly higher among younger teachers. Data show that teachers under age 30 have a readiness level of 71%, which decreases progressively in older age groups, reaching only 33% among teachers over age 50. This pattern indicates that age strongly influences confidence and technological adaptability. Younger teachers tend to be more flexible in experimenting with new applications, while older teachers often demonstrate greater caution and may be reluctant to adopt new technologies without clear training support.

Third, Buddhist teachers demonstrate more selective attitudes due to ethical and spiritual considerations. Interview findings show that some Buddhist teachers are more cautious about using AI, particularly regarding technologies that may affect relational and humanistic aspects of teaching. Several of them emphasize that AI must remain within the framework of *sīla*, mindfulness, and *right intention*, positioning AI as a supportive tool rather than one that replaces the pedagogical relationship between teacher and student. This value-oriented stance leads them to be more selective in choosing the types of AI applications they use.

Fourth, digital literacy emerges as a key factor influencing teachers' readiness. Beyond age and training experience, digital literacy appears to be one of the strongest predictors of AI adoption. Teachers who have sufficient technological access—such as personal laptops, high-capacity smartphones, and stable internet—tend to have greater confidence in experimenting with AI tools. Conversely, teachers with limited technological resources report greater difficulty in understanding and applying AI in TPD. This underscores the importance of technical readiness and digital infrastructure in supporting AI-based professional development.

Overall, teachers in Paschim Bardhaman demonstrate high awareness and positive attitudes toward AI use in their professional development. However, their levels of experience, digital literacy, and technical readiness vary significantly and have not yet reached an optimal level for deeper AI adoption. Readiness is strongly shaped by age, technological access, and ethical considerations—particularly among teachers in Buddhist educational contexts. These conditions highlight the need for training strategies that are more structured, inclusive, and sensitive to teachers' diverse values and backgrounds.

Forms of AI Utilization and Perceived Benefits Among Teachers

This section presents quantitative data on how teachers utilize AI within their Teacher Professional Development (TPD) activities and the benefits they perceive. Four main aspects were analyzed: (1) the use of AI tools for TPD, (2) the types of AI platforms used, (3) the frequency of use, and (4) teachers' satisfaction levels with these tools. These data illustrate the extent to which teachers have integrated AI into their professional practices.

Initial findings on the use of AI tools are presented in Table 6.

Table 6. Use of AI Tools in Teacher Professional Development (n = 245)

Question	Response Category	Number (n)	Percentage (%)
Use of AI tools for TPD	Yes	110	45%
	No	49	20%
	Unsure	86	35%

Types of AI-based TPD activities	Developing teaching materials	78	32%
	Curriculum analysis	41	17%
	Lesson reflection	56	23%
	Self-directed training	95	39%
	AI-based assessment tools	28	11%

The data in Table 6 show that AI utilization in TPD remains uneven, with only 45% of teachers reporting active use of AI tools, while 35% are unsure whether the tools they use qualify as AI. This suggests a conceptual literacy gap regarding what constitutes AI technology in educational contexts. In terms of activity types, teachers most frequently use AI for self-directed training (39%) and developing teaching materials (32%), whereas the use of AI for curriculum analysis (17%) and automated assessment (11%) remains low. These findings confirm that teachers primarily use AI for practical, individual-oriented tasks rather than for more complex evaluative or analytical activities.

The study also examined the AI platforms used by teachers and the frequency of usage. The complete data are shown in Table 7.

Table 7. AI Platforms Used by Teachers in Professional Development

AI Platform	Used (%)
ChatGPT	70%
Coursera (AI-based recommendation and analytics)	65%
Khan Academy (AI tutor and adaptive systems)	48%
Google AI Tools	34%
Others	12%

The data indicate that ChatGPT is the most widely used AI platform, with 70% of AI-utilizing respondents reporting its use. The relatively high usage of Coursera (65%) and Khan Academy (48%) suggests that teachers prefer platforms that offer professional content, training materials, and accessible automated learning systems. In contrast, the use of Google AI Tools remains comparatively low (34%), possibly due to higher technical complexity compared to text-based platforms like ChatGPT. The “Others” category (12%) includes various applications such as YouTube AI recommendations, Grammarly AI, and AI-based microtraining platforms.

Table 8. Frequency of AI Use for Professional Development

Frequency of Use	Percentage (%)
Daily	5%
Weekly	25%
Monthly	40%
Rarely	20%
Never	10%

Most teachers fall within the monthly use category (40%), suggesting that AI is used intermittently, primarily when needed—for example, when preparing training materials, designing instructional tools, or taking online courses. Only 5% reported daily use, indicating that AI integration into routine professional practices is still at an early stage. To evaluate the perceived impact of AI on professional development, teachers were asked to rate the benefits they experienced. The distribution of these benefits is presented in Table 9.

Table 9. Key Benefits Perceived by Teachers from AI Use

Type of Benefit	Percentage (%)
Personalized learning	52%
Time efficiency	68%
Broader access to learning resources	74%
Improved pedagogical reflection	47%
Support for instructional innovation	39%

Table 9 shows that the most frequently perceived benefits are broader access to learning resources (74%) and time efficiency (68%). This indicates that teachers view AI primarily as a tool that enables faster work processes and provides richer instructional materials. Pedagogical benefits such as personalized learning (52%) and enhanced teaching reflection (47%) are also significant, indicating that some teachers have begun to use AI to improve instructional quality, although these practices are not yet dominant. Benefits related to instructional innovation (39%) remain moderate, suggesting that teachers' AI use is still more focused on technical and administrative support rather than on transforming pedagogy.

The quantitative findings are strengthened by qualitative interview data from teachers who have adopted AI for professional purposes. A senior secondary teacher explained that AI helps them design more adaptive assignments for students with varying abilities, demonstrating that AI supports differentiated instruction rather than solely increasing efficiency. Another primary school teacher noted that AI enables them to evaluate lesson plans more quickly and identify areas for

improvement. These qualitative insights show that for teachers who have already adopted AI, the technology assists in accelerating work processes, expanding reflective capacity, and supporting the personalization of instructional strategies.

The data indicate that teachers primarily use AI for administrative and instructional planning tasks, such as creating teaching materials, self-directed training, and preparing instructional tools. Meanwhile, the use of AI for deeper pedagogical reflection, curriculum analysis, or automated evaluation remains limited. This pattern suggests that AI currently functions more as a technical support tool than as an instrument for substantive transformation in professional practice (Mondal, 2020).

Further analysis of the quantitative and qualitative data reveals four major patterns in the utilization of AI for teacher professional development in Paschim Bardhaman. First, AI is most frequently used for creating teaching materials and self-directed training, rather than for self-evaluation or complex learning analysis. The low use of AI for reflective purposes, such as automated assessment or lesson-plan analysis, shows that teachers still position AI within practical, immediate-benefit functions. Second, teachers in STEM fields tend to use AI more actively than teachers in the humanities. Although the study did not explicitly categorize respondents by subject area, interview and survey responses indicate that science and mathematics teachers are more accustomed to exploring technological platforms, including AI, to support conceptual understanding and material presentation. In contrast, humanities teachers tend to use AI more at a basic level, such as for searching references or refining teaching materials.

Third, teachers from Buddhist educational institutions show more selective use of AI, guided by principles of mindfulness and ethical considerations. They are more cautious in choosing AI applications and evaluate their relevance based on how well the technology aligns with values such as compassion, wisdom, and pedagogical integrity. This ethical orientation leads to slower but more morally reflective adoption within this group. Fourth, the greatest benefits teachers perceive are time efficiency and broader access to learning resources. Most respondents agree that AI helps accelerate administrative tasks and provides more diverse instructional materials. However, benefits associated with long-term professional development—such as enhanced reflective practice or pedagogical innovation—are not yet strongly felt by most teachers.

Thus, teachers' use of AI is gradual and remains light, primarily focused on practical functions such as material preparation and time-saving. AI technologies have not yet been fully utilized to strengthen the reflective, analytical, and transformative dimensions of teacher professional development. This indicates a need for training and mentoring strategies that can encourage deeper and more meaningful integration of AI into professional practice.

Barriers to AI Use and Implementation Strategies Aligned with Buddhist Values

This section presents quantitative data on the various barriers teachers experience when using AI for professional development, as well as how Buddhist values shape their attitudes toward and adoption of the technology. Four dimensions of barriers were analyzed: (1) concerns about data privacy, (2) perceived usability difficulties, (3) lack of institutional support and digital infrastructure, and (4) fears that AI may replace teachers' roles. Beyond technical and psychological barriers, the study highlights how Buddhist values such as *sīla*, right intention, and mindful use influence teachers' perspectives on AI integration. An overview of the barriers identified in the study is presented in Table 10.

Table 10. Barriers and Concerns Among Teachers Regarding AI Use in TPD (n = 245)

Type of Barrier	Response Category	Number (n)	Percentage (%)
Data privacy concerns (Scale 1–5)	1–2 (low)	34	14%
	3 (moderate)	50	20%
	4–5 (high)	161	66%
AI is too complex to use	Disagree (1–2)	68	28%
	Neutral (3)	84	34%
	Agree (4–5)	93	38%
Lack of institutional support	Disagree (1–2)	46	19%
	Neutral (3)	55	22%
	Agree (4–5)	144	59%
Fear that AI may replace teachers	Disagree (1–2)	82	33%
	Neutral (3)	55	23%
	Agree (4–5)	108	44%

The data in Table 10 show that concerns about data privacy and security constitute the most significant barrier, with 66% of teachers reporting high levels of concern. These concerns stem largely from the fear that personal and professional information uploaded to AI platforms could be misused. Additionally, 38% of teachers believe that AI tools remain too complex and require technical skills they have not yet developed. Another major barrier is the lack of institutional support,

with 59% of respondents stating that their schools or colleges have not provided adequate training or infrastructure to facilitate AI use.

Some teachers also expressed concern that excessive reliance on AI could diminish or replace the humanistic elements of professional learning, such as mentoring or interpersonal interaction. This concern is particularly pronounced among teachers from Buddhist institutions, where relational and ethical dimensions of teaching are emphasized. To further examine how AI-related barriers correspond to teachers' digital capacity, the study also analyzed differences in barriers based on digital literacy levels.

Table 11. Barriers to AI Use by Level of Digital Literacy

Digital Literacy Level	High (%) Reporting AI as a Barrier	Low (%) Reporting AI as a Barrier
Adequate internet access	42%	74%
Skillful with devices	38%	69%
Familiar with digital platforms	33%	58%
Not familiar with digital platforms	—	72%

The results in Table 11 reveal a strong correlation: the lower a teacher's digital literacy, the higher the barriers they report. Teachers with strong digital skills experience fewer obstacles, both in terms of usability and psychological concerns. Conversely, teachers who identify as unfamiliar with digital platforms reported barriers as high as 72%, particularly regarding AI complexity and uncertainty about data security. These findings reinforce that digital literacy is a principal determinant of teachers' readiness to adopt new technologies. The study also examined the distribution of barriers based on age groups, given the differences identified in earlier sub-findings.

Table 12. Major Barriers by Teacher Age Group

Age Group	High Data Privacy Concerns (%)	High Concern About AI Replacing Teachers (%)
< 30 years	52%	31%
31–40 years	61%	39%
41–50 years	70%	48%
> 50 years	82%	57%

Table 12 shows that teachers over the age of 50 experience the highest levels of barriers, both in terms of data privacy and fear that AI could diminish or replace their role. Meanwhile, younger teachers (<30 years) report the lowest levels of concern. This aligns with earlier findings showing that technological adaptation is strongly shaped by age and digital experience. Senior teachers tend to view AI as a threat to personal interaction, while younger teachers view it as a tool that accelerates work and enhances learning access.

Beyond technical and psychological obstacles, the study finds that Buddhist values significantly shape teachers' attitudes toward AI. Teachers in Buddhist institutions emphasize the need for AI integration to be ethical and mindful. Interview responses show that several teachers believe AI should never replace *karuṇā* (compassion) and the spiritual closeness inherent in teacher–student relationships. One teacher stated that any technology must be used with right intention and full awareness, in line with the principles of right intention and right action. This reflects a view that AI should be guided by moral values and a balanced relationship between technology and humanity.

The findings indicate that both technical and psychological barriers to AI use remain substantial among teachers, especially in Buddhist educational institutions where ethics, humanistic relationships, and moral principles are central to teaching and learning. Concerns about data privacy, lack of formal training, limited digital infrastructure, and fears that AI may diminish personal and spiritual elements in education are dominant factors that constrain AI utilization in professional development. Although teachers recognize AI's potential, structural barriers and ethical concerns slow down adoption and lead to highly selective use, influencing the broader readiness for AI integration in Buddhist educational environments.

A deeper analysis of the survey and interview data reveals four major patterns in teachers' barriers and ethical considerations regarding AI use. First, training and infrastructure barriers emerge as the most dominant impediments. Many teachers reported that they have never received formal AI training, while others face constraints related to unstable internet access and inadequate devices. As a result, AI utilization remains sporadic and poorly integrated into routine professional practices. Second, ethical concerns are significantly stronger among Buddhist teachers than among non-Buddhist teachers. They believe that AI should never undermine the dimensions of compassion, emotional closeness, and moral integrity in teacher–student relationships. These concerns include the potential loss of human interaction and the risk of overdependence on machines for tasks that have pedagogical and spiritual significance.

Third, AI adaptation efforts are more widely accepted when framed through Buddhist principles such as *sammā-diṭṭhi* (right understanding) and *majjhima paṭipadā* (the middle path). Buddhist teachers tend to use AI mindfully, selectively, and with right intention—focusing only on aspects that enhance learning quality

without compromising the relational and spiritual essence of education. This approach results in slower but more ethically reflective AI integration. Fourth, most teachers, both Buddhist and non-Buddhist, hold a consistent view that AI should function as an assistive tool rather than a replacement. Teachers perceive AI as a support system that accelerates administrative tasks and expands access to learning resources, but not as a substitute for human roles in imparting values, fostering empathy, and building emotional connections with students.

The successful implementation of AI in teacher professional development depends on a combination of enhanced digital competence, adequate digital infrastructure, and strong institutional support. In Buddhist educational settings, successful AI integration also requires a nuanced understanding of Buddhist values that emphasize ethics, balance, and mindful use of technology. By aligning technical capacity-building with ethical guidance, AI has the potential to support TPD without undermining the humanistic and spiritual dimensions that lie at the core of Buddhist education.

Discussion

The findings of this study indicate that teachers in the Paschim Bardhaman District demonstrate a relatively high level of awareness of AI and understand its potential to support Teacher Professional Development (TPD). Most teachers recognize that AI can enhance work efficiency, expand access to learning resources, personalize professional learning experiences, and accelerate pedagogical reflection. However, this awareness does not fully translate into actual practice. AI use remains limited to administrative tasks and lesson planning, whereas applications related to deep reflection, self-evaluation, and curriculum analysis remain underutilized. Several key barriers contribute to this gap, including insufficient formal training, limited digital infrastructure, concerns about data privacy, the perceived complexity of certain AI tools, and anxieties that AI may diminish the human role in education. These barriers are more pronounced among teachers in Buddhist institutions, who place strong emphasis on ethics, humanistic relationships, and moral integrity within teaching practice.

When viewed through the lens of Buddhist education, this condition reflects the *pariyatti–paṭipatti* stage, in which teachers possess conceptual understanding of AI but have not yet fully developed the capacity to apply it consistently. The principle of *bhāvanā* (gradual cultivation) highlights that digital transformation requires environmental support, structured training, and institutional conditions that enable steady practice. Thus, although teachers show an initial level of internal readiness, successful AI adoption requires training frameworks, policies, and infrastructure that align with Buddhist educational values emphasizing balance, wisdom, and mindful use of technology.

The gap between teachers' awareness and their technical experience can be explained by the absence of accessible and structured training opportunities. Teachers understand AI's benefits conceptually, yet lack opportunities to practice these concepts systematically, preventing their knowledge from developing into stable competencies. From a Buddhist perspective, this mirrors the principle of *sikkhā*, which underscores the need for *sammā vāyāma* (right effort) and long-term habituation to internalize skills. Teachers' concerns about data privacy and potential misuse of AI also reflect a lack of *sammā-diṭṭhi* (right understanding) regarding how data are processed, what risks may emerge, and how technology can be used safely and ethically. These uncertainties generate anxieties that could be mitigated through proper ethical education.

Similarly, the fear that AI may replace teachers represents a natural reaction to major changes that are not yet fully understood. Within a Buddhist framework, this reflects the need to apply *majjhima paṭipadā*—the middle way that avoids both extremes of rejecting technology entirely and embracing it uncritically. AI should not be viewed as a threat but rather as *upāya* (a skillful means) to be used mindfully to support, rather than replace, the teacher–student relationship grounded in compassion and wisdom. Consequently, the barriers identified in this study do not stem solely from technical issues but also from cognitive, ethical, and institutional dimensions. Mindful AI integration requires an ethical framing, staged learning, digital literacy, institutional support, and repeated practice aligned with Buddhist educational values.

The findings of this study align with global trends identified by RAND (2025) and the Microsoft Education Report (2025), which show that teachers' awareness of AI continues to increase, but this trend is not matched by technical readiness or adequate training opportunities. Previous research also shows that teachers tend to rely on accessible and popular AI platforms such as ChatGPT, Coursera, or Khan Academy—similar to the patterns identified in this study. The use of AI for reflective, analytical, and evaluative tasks remains limited both globally and within the present dataset.

In relation to prior literature, studies on AI in education have primarily focused on improving student learning outcomes through adaptive tutoring, learning analytics, and automated feedback (Chen et al., 2020; Luckin et al., 2016). Other studies examine AI's role in administrative efficiency, such as automated assessment (Zawacki-Richter et al., 2019). However, research specifically addressing how AI influences teacher professional development remains limited. Even fewer studies investigate how AI intersects with spirituality, value-based ethics, or Buddhist educational contexts.

This is where the novelty of the present study lies. By integrating key principles from Buddhist education—such as *sīla* (ethical conduct), *paññā* (analytic wisdom), and *upāya-kauśalya* (skillful means)—this study extends the scope of AI

discussions beyond its role as a pedagogical tool, framing it instead as a domain for ethical and reflective practice. This approach offers a new perspective on how AI can be used in a balanced, mindful, and responsible manner, particularly within educational environments grounded in spiritual and humanistic values. Thus, this study not only confirms international findings but also contributes a unique perspective by positioning Buddhist educational principles as a framework for evaluating, adopting, and utilizing AI in teacher professional development.

Historically**,** the findings of this study illustrate that teachers in Paschim Bardhaman are situated within a gradual and uneven phase of digital transition. This pattern aligns with global literature on digital transformation in education, which shows that the pace of technology adoption across countries and regions is strongly shaped by infrastructural readiness, educators' digital capacities, and the direction of educational policy (Mhlanga, 2023; Tran & Xuan, 2023). Digital transformation is not a single event, but a structural shift that requires consistent integration of technology into curriculum design, teacher training, school management, and data governance (Boztaş, Berigel, Altinay, & Altinay, 2025; Fang, Yao, & Qian, 2023).

In the context of this study, although teachers exhibit high levels of awareness regarding AI, barriers such as limited training, infrastructural constraints, and concerns about privacy indicate that the digital transformation process remains in its preliminary stages. This condition is consistent with earlier studies that emphasize the need for strong infrastructural and policy foundations before AI can be optimized for teacher professional development (Zhu & Hu, 2022).

From a Buddhist educational perspective, this dynamic reflects the principle of *anicca* (impermanence), which highlights that change is an inseparable part of the educational system's evolution. The integration of AI is not merely a technical innovation but part of an ongoing educational transformation. However, such change must be guided by *sati* (mindful awareness), ensuring that technology is used with an understanding of its risks, consequences, and underlying ethical values. In the spirit of *sīla* and *paññā*, digital transformation becomes meaningful only when it balances innovation with moral integrity and human values that are central in Buddhist education.

Socially, the findings reveal clear evidence of digital inequality among teachers, particularly in access to devices, internet stability, and levels of digital literacy. Teachers in schools with limited infrastructure or located in low-resource areas face significantly greater challenges. This condition mirrors global reports on digital equity, which show that socioeconomic and geographic disparities frequently determine access to educational technologies (Barragán Moreno & Guzmán Rincón, 2025; Topal & Geçer, 2024).

Digital literacy gaps further widen the divide in AI utilization. Younger teachers with higher digital skills integrate AI into TPD more easily, whereas senior teachers—especially those unfamiliar with digital platforms—encounter greater

technical and psychological barriers, including uncertainty, fear of misusing technology, and anxiety about being replaced. These inequalities directly affect students, as teachers' ability to integrate technology heavily influences the quality of digital learning experiences received by learners (Laius & Orgusaar, 2025; Willems, 2019).

In a Buddhist context, issues of digital equity resonate with the principles of *karuṇā* (compassion) and *dāna* (generosity). These principles emphasize the importance of ensuring that digital transformation does not create new forms of inequality. Instead, AI integration should be viewed as an ethical responsibility aimed at expanding equitable access to learning, especially for marginalized groups. Thus, the use of AI is not merely a technical action but an ethical endeavor to guarantee equal opportunities for all teachers and students within an increasingly digitalized educational ecosystem.

Ideologically**,** the study reveals a tension between humanistic educational values—which position teachers as moral, emotional, and spiritual guides—and the automation tendencies inherent in AI technologies. Teachers in Buddhist educational settings perceive their roles not merely as transmitters of content but as facilitators of inner growth, character development, and spiritual guidance. These dimensions cannot be replicated by machines, making concerns about AI diminishing human roles ideologically well-founded.

The Human-Centered AI (HCAI) paradigm aligns closely with these principles. The literature argues that AI should enhance human capacities rather than replace them by providing adaptive support, pedagogical reflection, and work efficiency (Katsenou, Kotsidis, Papadopoulou, Anastasiadis, & Deliyannis, 2025; Mobo, 2025). Research further emphasizes that AI remains effective only when embedded within strong human oversight to preserve the ethical, empathetic, and relational dimensions of learning (Apetorgbor, Akpabio, & Narad, 2024; von Davier & Burstein, 2024).

Buddhist philosophy provides a robust ideological foundation for understanding AI's place in education. The concept of *upāya* (skillful means) asserts that technology, including AI, has value only when it supports the cultivation of *paññā* (wisdom) and inner well-being, rather than substituting human qualities such as empathy, compassion, and spiritual guidance. The principle of *majjhima paṭipadā* encourages users to avoid two extremes: overreliance on technology and total rejection of it. Thus, AI must be positioned ideologically as a supportive tool that strengthens teacher–student relationships and enhances learning quality without undermining the essential values that ground Buddhist education.

This study serves to identify teachers' psychological readiness to adopt AI, map the forms of AI utilization in TPD, and highlight the barriers that hinder effective integration. It also contributes conceptually by offering a model of AI adoption aligned with Buddhist educational principles such as *sammā-diṭṭhi*, *sīla*,

and *bhāvanā*, thereby enriching discussions on value-based and ethical AI. Methodologically, the study clarifies the gap between high awareness and low implementation levels and provides comprehensive quantitative–qualitative evidence on the condition of teachers in Buddhist educational contexts.

However, the study also reveals structural dysfunctions in AI integration within teacher professional development. Gaps in digital capacity, lack of institutional policy, unclear data governance, and infrastructural limitations pose major obstacles. The study further confirms ethical anxieties that educational systems have not yet addressed adequately, including fears that AI may diminish relational dimensions of teaching that are essential in Buddhist education. Literature on AI governance asserts that without clear ethical, algorithmic, and operational frameworks, educational institutions cannot provide sufficient technical or moral support to teachers (Efstratopoulou, Argyriadi, & Argyriadis, 2025; Ma, Li, Hu, Liu, & Cheong, 2025). This situation is worsened by the absence of strong human oversight mechanisms, increasing the risks of algorithmic bias, data misuse, and diminished human roles (Leong & Zhang, 2025; Manganello, Nico, & Boccuzzi, 2025).

From a Buddhist educational viewpoint, such dysfunction arises due to the absence of *sammā-diṭṭhi* (right understanding) and *sammā-vāyāma* (right effort). Without these principles, technology integration risks becoming unbalanced—either overly dependent on AI or excessively resistant to it. Therefore, AI governance must maintain equilibrium among innovation, ethics, humanity, and spiritual development in learning.

Based on the dysfunctions identified, several action plans must be implemented to ensure that AI integration in teacher professional development occurs ethically, effectively, and in harmony with Buddhist educational values. First, educational institutions must build *right understanding* by designing comprehensive training programs that address not only technical skills but also deep understanding of AI mechanisms, privacy risks, data security, and ethical implications. These programs should be structured, continuous, and aligned with the principle of *sammā-vāyāma*, which highlights gradual and consistent effort. Second, strengthening a digital ethics framework grounded in *sīla* must form the foundation of AI implementation in schools, including data protection policies, algorithmic transparency, clear usage guidelines, and robust security protocols to ensure that teachers feel safe and protected.

Third, adopting a Human-Centered AI approach is essential, positioning AI as *upāya*—a pedagogical tool that enhances teachers' capacities rather than replacing them. This can be achieved through policies ensuring strong human oversight while encouraging teachers to use AI for administrative tasks, planning, and reflection, yet preserving the humanistic teacher–student relationship at the heart of education. Fourth, to ensure equitable technological access, institutions must invest in *karuṇā*-

based equity by strengthening digital infrastructure in underserved schools, providing devices, improving internet access, and distributing resources fairly to prevent socioeconomic or geographic disparities from hindering teachers' use of AI.

Fifth, educational institutions should establish teacher learning communities functioning similarly to the *Sangha*, serving as collective spaces where teachers share best practices, discuss ethical challenges, and develop digital literacy collaboratively. Such communities would cultivate a reflective and mindful approach to AI use. Finally, integrating mindfulness practices into technology use is essential so that teachers can manage anxiety, make ethical pedagogical decisions, and use AI in a balanced manner consistent with *majjhima paṭipadā*. By implementing these strategies, digital transformation can address technical needs while enriching the humanistic and spiritual dimensions of education, allowing AI to become a force that strengthens rather than disrupts the harmony of Buddhist education.

Conclusion

The findings of this study demonstrate that teachers in the Paschim Bardhaman District exhibit a high level of awareness regarding the potential of artificial intelligence (AI) to support their professional development, particularly in enhancing efficiency, personalizing learning, and expanding access to educational resources. Nonetheless, the actual use of AI remains limited and has not yet extended to deeper forms of pedagogical reflection. Major obstacles include the lack of formal training, limited digital infrastructure, concerns over data privacy, technical complexity, and anxieties that AI may diminish the humanistic role of teachers. These findings highlight a clear gap between teachers' conceptual understanding of AI and their ability to apply it consistently in practice.

From a Buddhist educational perspective, this condition reflects the *pariyatti–paṭipatti* stage, in which teachers understand AI conceptually but have not yet internalized its use as a stable component of their professional practice. The principles of *sammā-diṭṭhi*, *bhāvanā*, and *majjhima paṭipadā* provide an ethical framework for understanding that AI integration requires balance between technological innovation and the preservation of human qualities in education. These principles underscore that AI should be positioned as *upāya*—a supportive means that strengthens, rather than replaces, the values of wisdom, compassion, and interpersonal connection that lie at the heart of Buddhist education.

Scientifically, this study offers several important contributions. First, it expands the discourse on AI in education by focusing on Teacher Professional Development (TPD), an area that remains less explored compared to AI's impact on student learning. Second, it provides comprehensive empirical data on the awareness, actual use, and challenges of AI within a South Asian and Buddhist educational context, offering a contextual map that can inform educational policy,

curriculum development, and teacher training programs. Third, it introduces a significant theoretical contribution by integrating Buddhist educational principles, thereby offering a new approach to understanding AI not merely as a technological tool but as a domain for ethical, reflective, and spiritual practice. This perspective enriches the global literature on Human-Centered AI by incorporating value-based frameworks grounded in Buddhist tradition.

This study, however, has limitations. First, its geographical scope is limited to a single district, which means generalizations must be made cautiously. Second, the study focuses on teachers' perceptions and experiences without directly evaluating AI implementation in classroom settings, making it impossible to assess the pedagogical effectiveness of AI use comprehensively. Third, the lack of longitudinal data prevents the study from capturing long-term changes in teachers' digital readiness. Future research should therefore expand the geographical coverage, conduct classroom-based evaluations of AI implementation, and adopt longitudinal approaches to examine the development of teachers' digital competencies over time. Additionally, future studies could incorporate in-depth analysis of training designs grounded in Buddhist values to develop ethical, balanced, and human-centered frameworks for AI integration.

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