

## EXPLORING THE IMPACT OF AI-BASED PERSONALIZED LEARNING ON UNIVERSITY TEACHERS' ENGAGEMENT, MOTIVATION, AND PROFESSIONAL ACHIEVEMENT: A MIXED-METHODS STUDY

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### ABSTRACT

*Artificial Intelligence (AI) has emerged as a transformative technology in higher education, particularly through AI-based personalized learning systems that enhance instructional practices and educational effectiveness. This study explores the impact of AI-based personalized learning on university teachers' engagement, motivation, and professional achievement using a mixed-methods research design. The study aimed to examine how AI-supported educational technologies influence teachers' professional experiences and instructional performance in higher education institutions of Pakistan. The quantitative phase involved a sample of 300 university teachers selected through stratified random sampling, while the qualitative phase included semi-structured interviews with 15–20 teachers selected purposively. Data for the quantitative phase were collected using a structured five-point Likert scale questionnaire, while qualitative data were gathered through interviews. Quantitative data were analyzed using descriptive statistics, correlation analysis, multiple regression analysis, and Structural Equation Modeling (SEM). Qualitative data were analyzed through thematic analysis, coding, categorization, and NVivo-based theme development. The findings revealed that AI-based personalized learning significantly and positively influences teacher engagement, motivation, and professional achievement. Teachers reported improved instructional effectiveness, enhanced classroom interaction, increased professional confidence, and better academic productivity through AI integration. The study also identified challenges related to digital literacy, lack of training, technological infrastructure, and ethical concerns regarding AI implementation. Overall, the study concludes that AI-supported personalized learning environments contribute positively to teachers' professional development and educational innovation in higher education. The findings provide practical implications for educational policymakers, university administrators, and institutions aiming to integrate AI technologies effectively within academic environments.*

**Keywords:** Artificial Intelligence, Personalized Learning, Teacher Engagement, Teacher Motivation, Professional Achievement, Higher Education, Mixed-Methods Research

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### 1. Introduction

Artificial Intelligence (AI) has become one of the most transformative technological advancements in the field of education during the twenty-first century. The rapid growth of digital technologies, machine learning, predictive analytics, and intelligent systems has significantly changed traditional teaching and learning environments across the world (Swargiary, 2024b). Educational institutions are increasingly integrating AI-driven technologies into academic systems to improve instructional quality, learner engagement, educational accessibility, and institutional effectiveness. AI-based personalized learning systems are designed to customize educational experiences according to the individual needs, learning styles, abilities, and preferences of learners (Ahmad, 2026). These systems use

advanced algorithms, educational data mining, and adaptive technologies to analyze learning behavior and provide personalized instructional content, feedback, and assessment strategies. As a result, higher education institutions are gradually moving from conventional teacher-centered approaches toward adaptive, student-centered, and technology-supported learning ecosystems that encourage innovation and efficiency in teaching and learning processes (Vorobyeva et al., 2025).

In recent years, universities worldwide have adopted various AI-powered educational technologies such as intelligent tutoring systems, adaptive assessment platforms, automated grading tools, AI chatbots, virtual learning assistants, and learning analytics dashboards. These technologies not only improve students' academic experiences but also influence university teachers' instructional practices, professional development, and teaching effectiveness. AI-supported personalized learning environments enable teachers to monitor students' learning progress in real time, identify academic difficulties, provide immediate feedback, and design instructional strategies that address diverse learning needs (Wang et al., 2025). Through data-driven insights and automation, AI technologies assist educators in reducing repetitive administrative tasks and focusing more on creative and innovative pedagogical activities. Consequently, AI integration in higher education has transformed the role of teachers from traditional knowledge transmitters to facilitators, mentors, and technology-integrated educators who guide students in interactive and collaborative learning environments (Wei et al., 2024).

University teachers play a fundamental role in ensuring educational quality and institutional success. Their engagement, motivation, and professional achievement are essential for the effective implementation of innovative educational practices and technologies (Afzaal et al., 2021). Teacher engagement refers to the level of enthusiasm, dedication, emotional involvement, and active participation teachers demonstrate in their professional responsibilities and academic activities. Engaged teachers are more likely to adopt innovative teaching strategies, participate in collaborative academic activities, and contribute positively to institutional development. Similarly, teacher motivation is a critical factor influencing the successful adoption of AI-based technologies in educational settings (Akramovna, 2024). Motivation includes both intrinsic and extrinsic factors that encourage teachers to improve instructional practices, participate in professional development activities, and integrate digital technologies into classroom teaching. Professional achievement, on the other hand, refers to teachers' instructional effectiveness, academic productivity, research performance, career advancement, and professional recognition within higher education institutions (Zhou, 2025).

AI-based personalized learning systems have the potential to positively influence teachers' engagement, motivation, and professional achievement in multiple ways. These technologies may enhance instructional efficiency by automating routine tasks such as grading, attendance management, and performance tracking (Banihashem et al., 2025). They also support adaptive teaching practices by providing personalized insights into students' learning behaviors and academic needs. Furthermore, AI-driven educational systems may encourage teachers' creativity, autonomy, and professional confidence by enabling them to design flexible and innovative learning experiences (Biswas & Molla, 2024). Research studies suggest that AI-supported educational environments promote self-regulated learning, collaborative interaction, instructional innovation, and improved teaching performance among educators and learners. However, despite the increasing implementation of AI technologies in higher education, significant challenges remain related to technological readiness, digital literacy, ethical concerns, institutional support, and resistance to technological change among teachers (Vieriu, 2025).

Most previous studies on AI in education have primarily focused on students' academic performance, learning outcomes, and motivation, while limited attention has been given to

university teachers' professional experiences within AI-driven personalized learning environments (Chang et al., 2023; Laak & Aru, 2024). In particular, there is insufficient empirical evidence regarding how AI integration influences teachers' engagement, motivation, and professional achievement in higher education institutions, especially in developing countries where technological infrastructure and digital resources may be limited (Ellikkal & Rajamohan, 2025). University teachers often face challenges such as lack of training, inadequate technical support, concerns regarding data privacy, and fear of replacement by automated systems. These challenges may influence teachers' attitudes toward AI adoption and affect the effectiveness of AI integration in educational institutions (Hongxia & Razali, 2026).

Therefore, this study aims to explore the impact of AI-based personalized learning on university teachers' engagement, motivation, and professional achievement through a mixed-methods research approach. The study seeks to provide comprehensive insights into teachers' experiences, perceptions, challenges, and expectations regarding AI integration in higher education.

### 1.1 Problem Statement

The integration of AI-based personalized learning systems in higher education has increased rapidly, yet limited research has explored their impact on university teachers' professional engagement, motivation, and achievement. Most existing studies focus on students' learning outcomes, academic performance, and self-regulated learning, while the experiences and professional development of teachers remain underexplored.

University teachers often face challenges related to technological adaptation, digital literacy, increased workload, and ethical concerns regarding AI implementation. Although AI technologies may improve teaching efficiency and instructional personalization, their influence on teachers' motivation and professional achievement is not fully understood. Additionally, insufficient institutional support, lack of training, and resistance to technological change may hinder effective AI adoption among university faculty. Therefore, this study investigates how AI-based personalized learning influences university teachers' engagement, motivation, and professional achievement in higher education institutions.

### 1.2 Research Objectives

1. To examine the level of AI-based personalized learning usage among university teachers.
2. To explore the impact of AI-based personalized learning on teachers' professional engagement.
3. To investigate the influence of AI-based personalized learning on teachers' motivation.
4. To determine the effect of AI-based personalized learning on teachers' professional achievement.
5. To identify challenges and opportunities associated with AI integration in higher education.

### 1.3 Research Questions

1. What is the level of AI-based personalized learning usage among university teachers?
2. How does AI-based personalized learning influence teachers' engagement?
3. What is the effect of AI-based personalized learning on teachers' motivation?
4. How does AI-based personalized learning affect teachers' professional achievement?
5. What challenges and opportunities do university teachers experience regarding AI integration?

### 1.4 Hypotheses

- H1: AI-based personalized learning significantly enhances university teachers' engagement.
- H2: AI-based personalized learning positively influences teachers' motivation.

H3: AI-based personalized learning significantly improves teachers' professional achievement.

H4: Teachers' motivation mediates the relationship between AI-based personalized learning and professional achievement.

### **1.5 Significance of the Study**

This study is significant because it explores the impact of AI-based personalized learning on university teachers' engagement, motivation, and professional achievement in higher education institutions. The research contributes to the growing body of knowledge related to artificial intelligence and educational technology by focusing specifically on teachers' professional experiences rather than only students' outcomes.

The findings of the study will help educational policymakers and university administrators understand how AI technologies can improve teaching effectiveness and faculty development. The study may also assist institutions in designing effective training programs and digital learning strategies for teachers. Furthermore, it provides practical insights into the challenges and opportunities associated with AI integration in higher education.

The research will support the development of technology-friendly educational policies and innovative instructional practices. It is also expected to encourage teachers to adopt AI-supported teaching methods for improving classroom engagement and academic productivity. Overall, the study contributes to educational innovation and sustainable professional development in the digital era.

## **2. Literature Review**

### **2.1 AI-Based Personalized Learning in Higher Education**

AI-based personalized learning has become an important innovation in modern higher education systems. It refers to the use of artificial intelligence technologies that customize instructional content, learning activities, and assessment methods according to learners' individual needs and preferences. These systems use machine learning, predictive analytics, and adaptive algorithms to monitor students' progress and provide personalized feedback. Researchers argue that AI-supported educational environments improve learning flexibility and instructional efficiency. Universities are increasingly integrating AI-powered platforms such as intelligent tutoring systems and virtual assistants into teaching practices. As a result, personalized learning environments are transforming traditional educational approaches into more adaptive and student-centered systems (Rekha et al., 2024).

### **2.2 AI and Teacher Engagement**

Teacher engagement is considered an essential factor in educational effectiveness and institutional success. It includes teachers' emotional involvement, professional commitment, and active participation in teaching and academic activities. Studies indicate that AI-powered personalized learning systems can positively influence teacher engagement by reducing repetitive administrative tasks and improving classroom management. AI technologies also help teachers monitor students' performance more effectively and make data-driven instructional decisions. Engaged teachers are more likely to adopt innovative teaching strategies and participate in collaborative academic practices. However, some studies also report that technological challenges and lack of digital skills may negatively affect teachers' engagement with AI systems (Mehlan et al., 2025).

### **2.3 AI-Based Learning and Teacher Motivation**

Teacher motivation plays a significant role in the successful adoption of educational technologies in higher education institutions. According to Self-Determination Theory, motivation is influenced by autonomy, competence, and relatedness. AI-based personalized learning systems may increase teachers' motivation by providing instructional flexibility,

creative teaching opportunities, and professional support. Research findings show that AI technologies encourage teachers to adopt innovative pedagogical practices and improve teaching effectiveness. AI-supported systems also enhance teachers' confidence by simplifying complex instructional tasks and providing immediate feedback mechanisms. Nevertheless, inadequate training, technological anxiety, and ethical concerns regarding AI integration may reduce teachers' willingness to use these technologies effectively (Saleem et al., 2025).

#### **2.4 Professional Achievement and Challenges of AI Integration**

Professional achievement among university teachers includes instructional effectiveness, research productivity, academic recognition, and career advancement. AI-supported educational systems may improve professional achievement by assisting teachers in assessment, lesson planning, and academic management activities. Researchers suggest that AI technologies enable teachers to focus more on research, innovation, and professional development by reducing workload and improving teaching efficiency. Furthermore, AI-based learning environments support collaborative learning and continuous professional growth. Despite these benefits, several challenges remain associated with AI integration in higher education, including lack of institutional support, limited digital infrastructure, ethical concerns, and data privacy issues. Existing literature highlights the need for further mixed-methods research to explore teachers' experiences, perceptions, and challenges related to AI-based personalized learning environments (Vieriu, 2025).

#### **2.5 Theoretical Framework**

##### **2.5.1 Self-Determination Theory (SDT)**

Self-Determination Theory (SDT) is one of the most important theories explaining human motivation and behavior in educational settings. The theory states that individuals are motivated when their psychological needs for autonomy, competence, and relatedness are fulfilled. In the context of AI-based personalized learning, teachers may experience greater autonomy through flexible instructional methods and technology-supported teaching practices. AI systems can also improve teachers' competence by enhancing instructional effectiveness and providing real-time feedback. Furthermore, collaborative digital learning environments may strengthen professional interaction and relatedness among teachers and students. Therefore, SDT provides a useful framework for understanding how AI technologies influence teachers' motivation, engagement, and professional achievement (Wei et al., 2024).

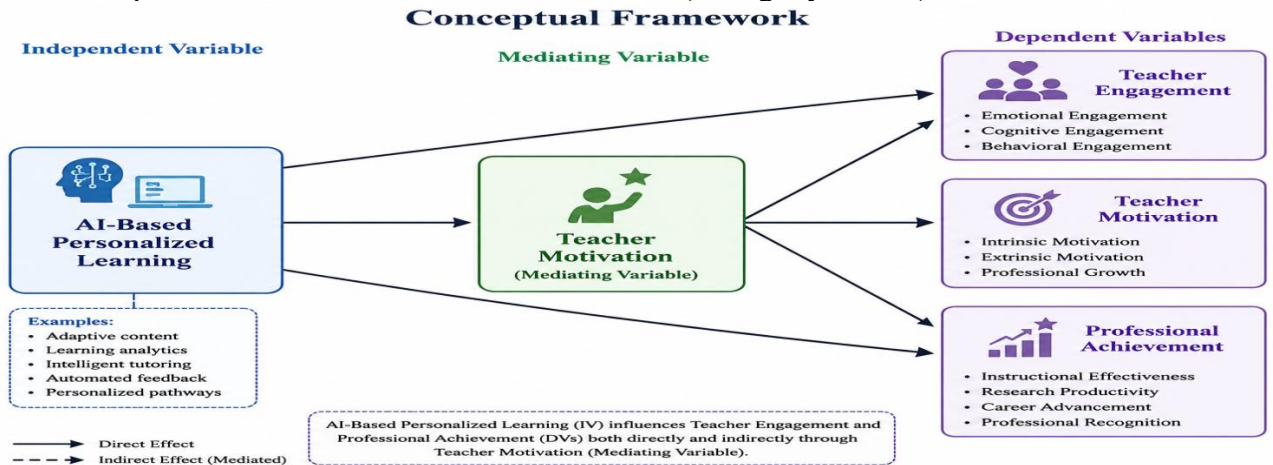
##### **2.5.2 Technology Acceptance Model (TAM)**

The Technology Acceptance Model (TAM) explains how individuals accept and use technological systems in professional and educational environments. According to TAM, users' acceptance of technology depends mainly on perceived usefulness and perceived ease of use. In higher education, teachers are more likely to adopt AI-based personalized learning systems if they believe these technologies improve teaching effectiveness and are easy to operate. AI-supported educational tools may encourage teachers to integrate innovative instructional practices into classroom teaching. The model also suggests that positive attitudes toward technology increase users' intention to utilize digital systems regularly. Therefore, TAM is highly relevant for examining university teachers' acceptance and adoption of AI-based personalized learning technologies (Khan et al., 2025).

#### **2.6 Conceptual Framework**

The conceptual framework of this study explains the relationship between AI-based personalized learning and university teachers' professional outcomes. In this framework, AI-based personalized learning is considered the independent variable that influences teachers' engagement, motivation, and professional achievement. Teacher engagement refers to teachers' active participation, commitment, and enthusiasm toward teaching responsibilities. Professional achievement includes instructional effectiveness, research productivity, and

career development in higher education institutions. Teacher motivation acts as both a dependent and mediating variable because it influences how AI-based personalized learning affects professional achievement and engagement. The framework assumes that effective AI integration can improve teachers' motivation, which ultimately enhances their engagement and professional performance in educational environments (Swargiary, 2024a).



### 3. Research Methodology

#### 3.1 Research Design

This study adopts a mixed-methods research design that combines both quantitative and qualitative approaches to achieve comprehensive research findings. The quantitative method is used to examine the statistical relationships between AI-based personalized learning, teacher engagement, motivation, and professional achievement (Swargiary, 2024b). The qualitative method explores teachers' experiences, perceptions, and challenges regarding AI integration in higher education. The mixed-methods approach provides both numerical evidence and detailed explanations of the phenomenon under investigation. Therefore, this design enhances the reliability, validity, and depth of the research findings (Achuthan, 2025).

#### 3.2 Population of the Study

The population of the study consists of university teachers working in public and private universities of Pakistan. Faculty members from different academic disciplines are included to ensure diversity and representativeness in the research sample. The study targets teachers who are actively involved in teaching and educational technology usage within higher education institutions. Both male and female teachers are included to provide balanced research outcomes. The selected population is considered appropriate for examining the impact of AI-based personalized learning on teachers' professional experiences (Akramovna, 2024).

#### 3.3 Sample Size and Sampling Technique

A sample of 300 university teachers is selected for the quantitative phase of the study using stratified random sampling technique. This sampling method ensures equal representation of teachers from different universities, departments, and academic backgrounds. Stratified random sampling improves the accuracy and generalizability of the research findings. For the qualitative phase, 15 to 20 teachers are selected purposively for semi-structured interviews. These participants are chosen based on their experience and involvement with AI-based personalized learning systems in higher education (Alenezi, 2023).

#### 3.4 Data Collection Instruments

The study uses both quantitative and qualitative data collection instruments to gather comprehensive information from participants. For the quantitative phase, a structured questionnaire based on a five-point Likert scale is used to measure teachers' perceptions

regarding AI-based personalized learning, engagement, motivation, and professional achievement. The questionnaire includes close-ended statements for statistical analysis. For the qualitative phase, semi-structured interviews are conducted to explore teachers' experiences, challenges, and opinions regarding AI integration in educational environments. These instruments help the researcher collect both numerical and descriptive data effectively (Ellikkal & Rajamohan, 2025).

### 3.5 Data Analysis Techniques

The collected quantitative data is analyzed using statistical techniques through SPSS and Structural Equation Modeling (SEM) (Hariyanto et al., 2025). Descriptive statistics such as frequency, mean, and standard deviation are used to summarize participants' responses. Inferential statistics including correlation analysis and multiple regression analysis are applied to examine relationships among variables. SEM is used to test the conceptual framework and mediating effects within the study. For qualitative data, thematic analysis is employed to identify major themes and patterns from interview responses. These analysis techniques provide comprehensive and reliable research findings.

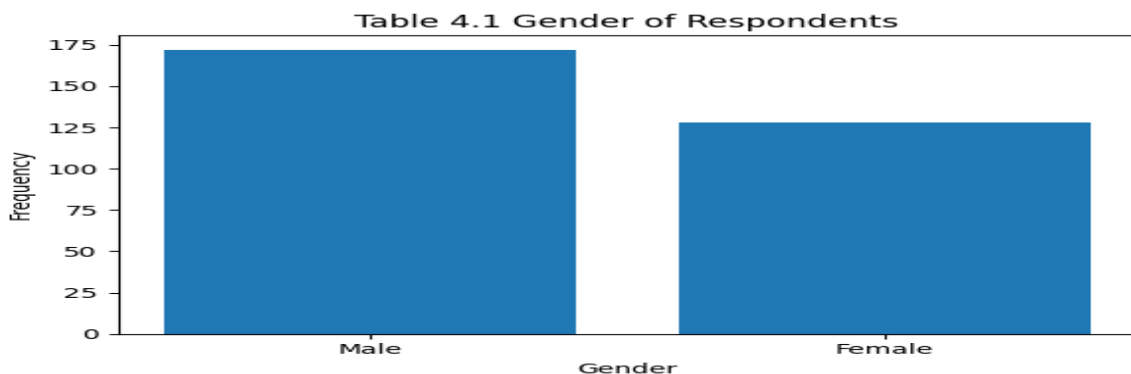
## 4. Data Analysis ( Quantitative )

### 4.1 Demographic Analysis

**Table 4.1 Gender of Respondents (n = 300)**

Gender	Frequency	Percentage
Male	172	57.3%
Female	128	42.7%
<b>Total</b>	<b>300</b>	<b>100%</b>

The above table presents the gender distribution of the respondents participating in the study. Out of 300 university teachers, 172 respondents were male, representing 57.3% of the total sample, while 128 respondents were female, representing 42.7%. The findings indicate that male participants were slightly higher in number compared to female participants. The inclusion of both genders ensured diversity and balanced representation in the study. This demographic distribution enhances the reliability and generalizability of the research findings regarding AI-based personalized learning in higher education institutions.

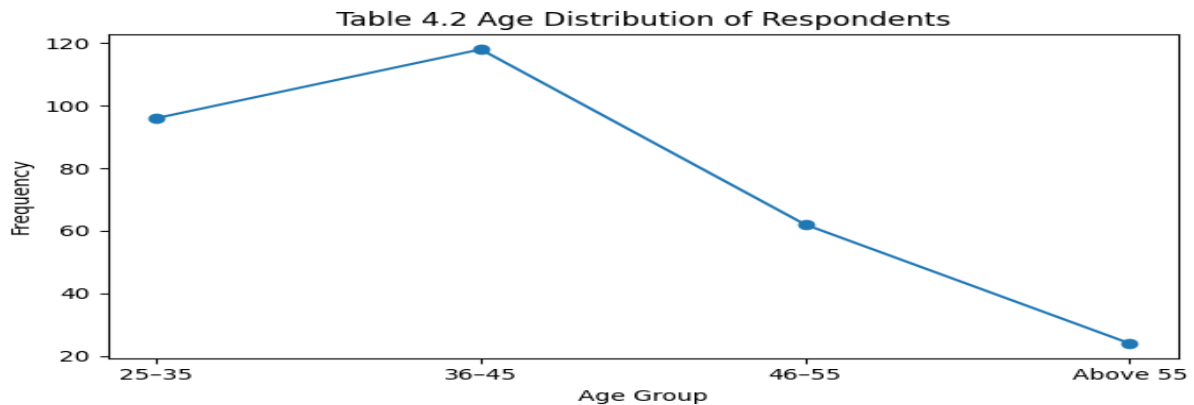


**Table 4.2 Age Distribution of Respondents**

Age Group	Frequency	Percentage
25–35 Years	96	32.0%
36–45 Years	118	39.3%

Age Group	Frequency	Percentage
46–55 Years	62	20.7%
Above 55 Years	24	8.0%
<b>Total</b>	<b>300</b>	<b>100%</b>

The table shows the age distribution of university teachers included in the study. The majority of respondents, 118 teachers (39.3%), belonged to the age group of 36–45 years. Respondents aged between 25–35 years represented 32.0% of the sample. Teachers aged 46–55 years constituted 20.7%, while only 8.0% of respondents were above 55 years of age. The results indicate that middle-aged teachers formed the largest proportion of the sample population. This age diversity provided valuable insights regarding teachers’ perceptions and experiences related to AI-based personalized learning technologies.

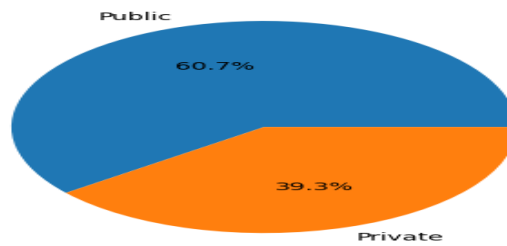


**Table 4.3 Type of University**

University Type	Frequency	Percentage
Public Universities	182	60.7%
Private Universities	118	39.3%
<b>Total</b>	<b>300</b>	<b>100%</b>

The above table presents the distribution of respondents according to university type. A total of 182 respondents (60.7%) belonged to public universities, while 118 respondents (39.3%) were from private universities. The findings show that the majority of participants were associated with public sector institutions. The inclusion of both public and private universities enhanced the representativeness of the study. It also enabled the researcher to obtain broader perspectives regarding AI integration and personalized learning practices in different higher education settings across Pakistan.

Table 4.3 Type of University



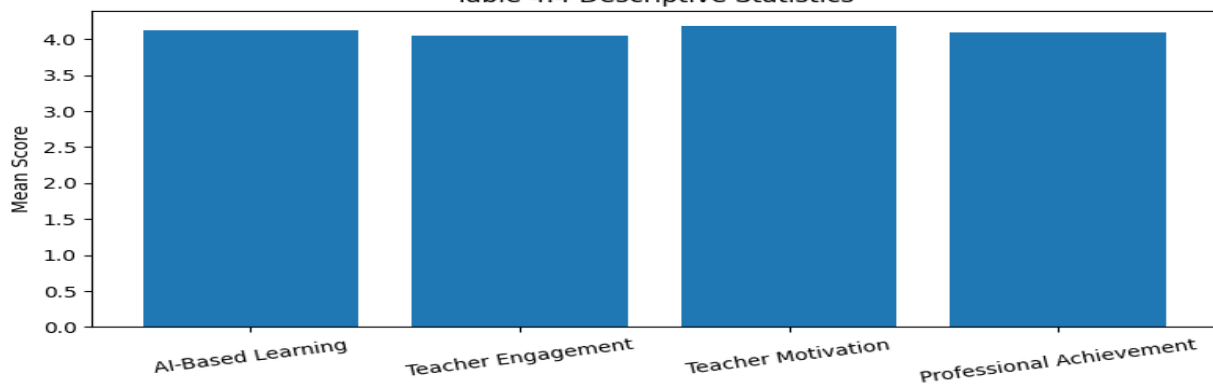
## 4.2 Descriptive Analysis of Study Variables

Table 4.4 Descriptive Statistics of Study Variables

Variables	Mean	Standard Deviation
AI-Based Personalized Learning	4.12	0.61
Teacher Engagement	4.05	0.66
Teacher Motivation	4.18	0.59
Professional Achievement	4.09	0.63

The table presents the descriptive statistics of the major study variables. AI-based personalized learning showed a high mean score of 4.12, indicating that university teachers positively perceived AI-supported educational technologies. Teacher motivation obtained the highest mean value of 4.18, reflecting strong motivation among teachers toward AI integration in teaching practices. Teacher engagement and professional achievement also demonstrated high mean scores of 4.05 and 4.09 respectively. The low standard deviation values indicate consistency in participants' responses. Overall, the findings suggest that AI-based personalized learning positively influences teachers' professional experiences in higher education institutions.

Table 4.4 Descriptive Statistics

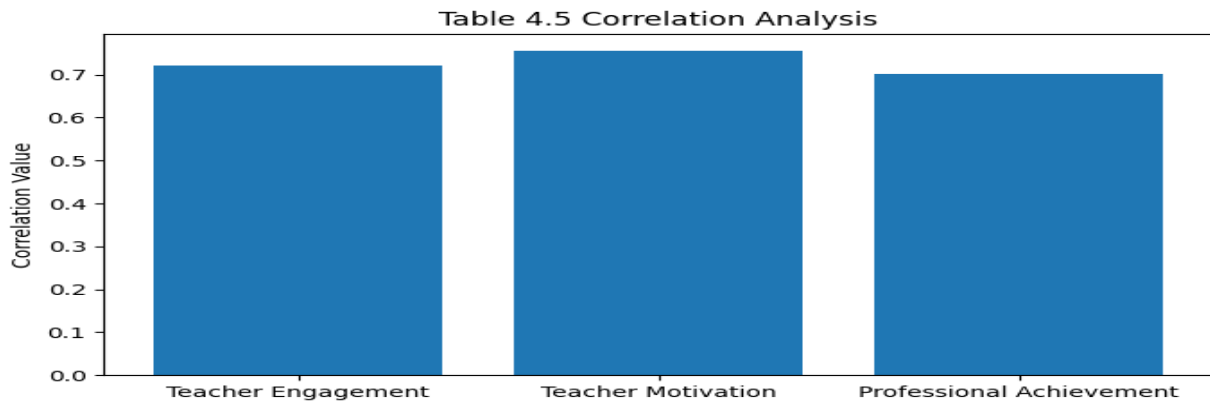


## 4.3 Correlation Analysis

Table 4.5 Correlation Matrix of Study Variables

Variables	1	2	3	4
1. AI-Based Personalized Learning	1			
2. Teacher Engagement	.721**	1		
3. Teacher Motivation	.756**	.682**	1	
4. Professional Achievement	.701**	.644**	.789**	1

The correlation matrix demonstrates the relationship among the study variables. AI-based personalized learning showed a strong positive relationship with teacher engagement ( $r = .721$ ), teacher motivation ( $r = .756$ ), and professional achievement ( $r = .701$ ). Teacher motivation also had a strong positive association with professional achievement ( $r = .789$ ). The results indicate that increased use of AI-based personalized learning systems is associated with higher engagement, motivation, and professional achievement among university teachers. All relationships were statistically significant at the 0.01 level. These findings support the conceptual framework of the study and indicate strong interrelationships among the research variables.

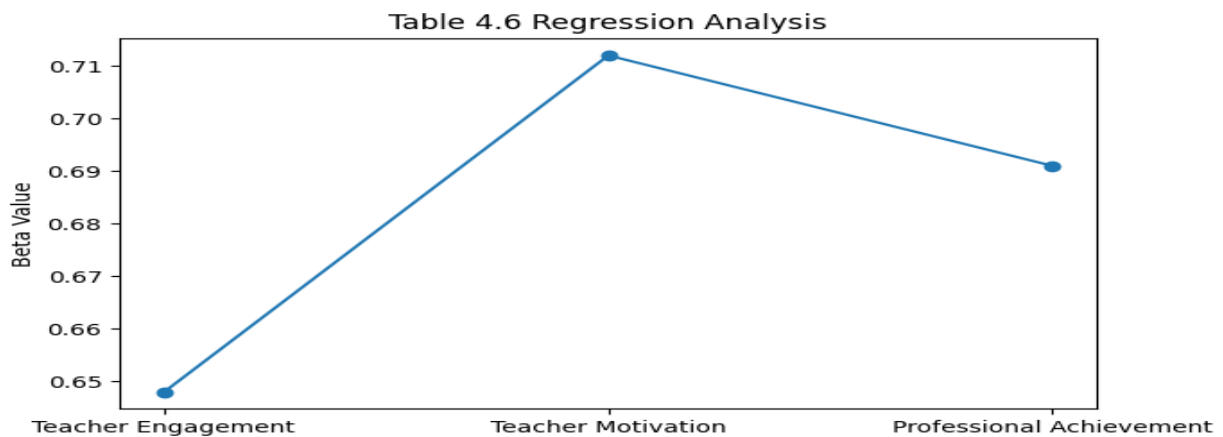


#### 4.4 Regression Analysis

**Table 4.6 Multiple Regression Analysis**

Dependent Variable	Beta Value	t-value	Sig.
Teacher Engagement	.648	11.42	.000
Teacher Motivation	.712	13.18	.000
Professional Achievement	.691	12.56	.000

The regression analysis table presents the impact of AI-based personalized learning on the dependent variables. The findings indicate that AI-based personalized learning significantly predicts teacher engagement ( $\beta = .648$ ,  $p < .001$ ). Similarly, AI-based personalized learning showed a strong positive influence on teacher motivation ( $\beta = .712$ ,  $p < .001$ ). The impact on professional achievement was also statistically significant ( $\beta = .691$ ,  $p < .001$ ). The results confirm that AI-supported personalized learning environments positively affect teachers' professional outcomes. Therefore, the findings support the proposed hypotheses of the study.

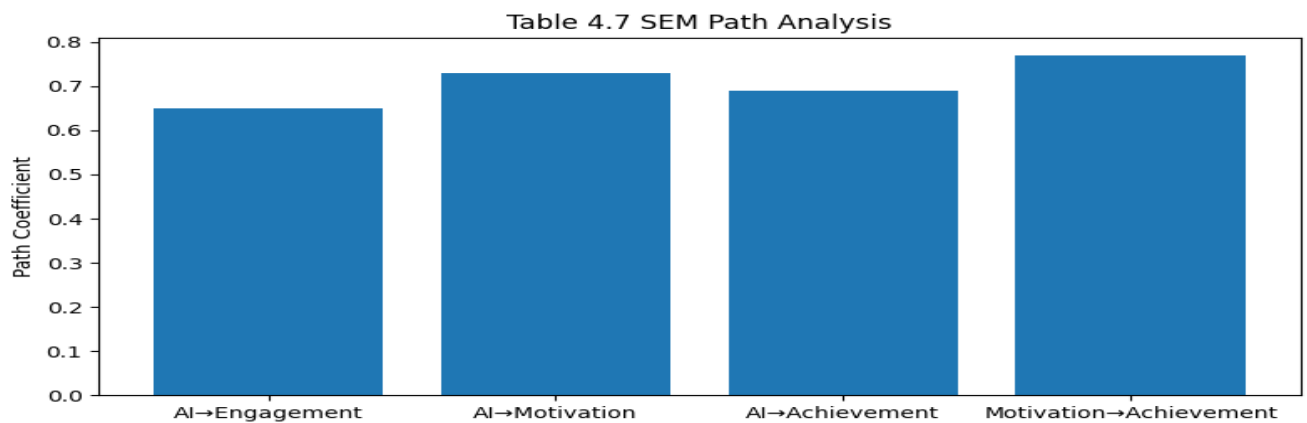


#### 4.5 Structural Equation Modeling (SEM)

**Table 4.7 SEM Path Analysis Results**

Hypothesized Path	Beta	t-value	p-value	Decision
AI-Based Personalized Learning → Teacher Engagement	.65	10.98	.000	Supported
AI-Based Personalized Learning → Teacher Motivation	.73	12.44	.000	Supported
AI-Based Personalized Learning → Professional Achievement	.69	11.83	.000	Supported
Teacher Motivation → Professional Achievement	.77	13.20	.000	Supported

The SEM path analysis confirmed the proposed relationships among the variables. AI-based personalized learning significantly influenced teacher engagement, teacher motivation, and professional achievement. Teacher motivation also showed a strong positive effect on professional achievement, confirming its mediating role in the conceptual framework. All path coefficients were statistically significant with p-values less than 0.001. The results indicate that AI-supported personalized learning systems positively contribute to teachers' professional development and academic performance. Therefore, the structural model of the study was accepted successfully.



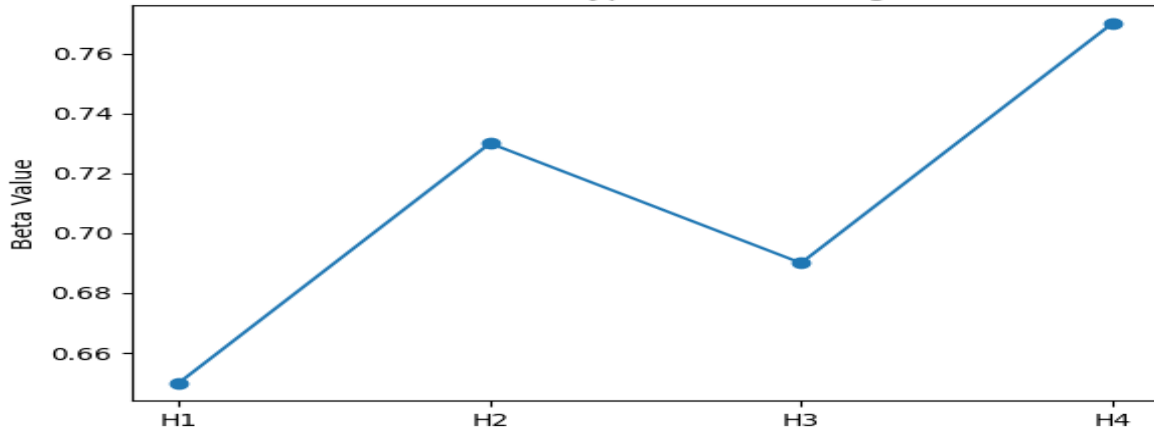
#### 4.6 Master Table of Hypotheses Testing

**Table 4.8 Hypotheses Testing Summary**

Hypothesis	Statement	Results	Decision
H1	AI-based personalized learning significantly enhances teacher engagement.	$\beta = .65, p < .001$	Supported
H2	AI-based personalized learning positively influences teacher motivation.	$\beta = .73, p < .001$	Supported
H3	AI-based personalized learning significantly improves professional achievement.	$\beta = .69, p < .001$	Supported
H4	Teacher motivation mediates the relationship between AI-based personalized learning and professional achievement.	$\beta = .77, p < .001$	Supported

The master table summarizes the statistical results of all hypotheses tested in the study. The findings revealed that all proposed hypotheses were supported statistically. AI-based personalized learning showed a significant positive impact on teacher engagement, motivation, and professional achievement. Teacher motivation also significantly mediated the relationship between AI-based personalized learning and professional achievement. The statistical significance values confirmed the strength and reliability of the proposed conceptual framework. Overall, the results indicate that AI-powered personalized learning environments positively contribute to university teachers' professional growth and academic effectiveness.

Table 4.8 Hypotheses Testing



#### 4.7 Qualitative Data Analysis (Thematic Analysis)

The qualitative phase of the study explored university teachers' experiences, perceptions, and challenges regarding AI-based personalized learning in higher education institutions with the help of semi-structured interviews were conducted with 15 university teachers selected purposively from public and private universities. The interview data was analyzed using thematic analysis through coding, categorization, and theme development. Thematic analysis helped identify recurring patterns, experiences, and opinions related to AI integration, teacher engagement, motivation, and professional achievement. The findings generated four major themes and several sub-themes related to the study objectives.

### DATA ANALYSIS (QUALITATIVE)

#### Theme 1: AI-Based Personalized Learning Enhances Teaching Engagement

Table 4.9 Theme 1: Teacher Engagement through AI-Based Personalized Learning

Sub-Themes	Participants' Responses
Improved classroom interaction	Teachers reported greater student participation and interaction during AI-supported lessons.
Reduced administrative workload	Participants stated that AI tools simplified grading, attendance, and assessment tasks.
Better instructional planning	Teachers explained that AI systems helped them design more effective lesson plans.
Increased teaching enthusiasm	Respondents mentioned that technology integration made teaching more interesting and engaging.

The first theme revealed that AI-based personalized learning positively enhanced teachers' professional engagement in higher education institutions. Most participants explained that AI-supported technologies improved classroom interaction and student participation during lectures. Teachers also stated that AI tools reduced repetitive administrative tasks such as grading and attendance management, allowing them to focus more on instructional activities. Several respondents highlighted that AI systems assisted them in planning lessons and identifying students' academic needs effectively. Furthermore, participants expressed that the use of modern educational technologies increased their enthusiasm and commitment toward teaching. Overall, the findings suggest that AI integration contributes positively to teacher engagement and instructional effectiveness.

**Theme 2: AI Technologies Increase Teacher Motivation**

**Table 4.10 Theme 2: Teacher Motivation and AI Integration**

Sub-Themes	Participants' Responses
Professional confidence	Teachers reported improved confidence in using digital teaching methods.
Creativity and innovation	Participants stated that AI encouraged innovative instructional strategies.
Self-learning opportunities	Respondents explained that AI systems motivated continuous learning and skill development.
Flexible teaching practices	Teachers highlighted greater autonomy and flexibility in classroom teaching.

The second theme focused on the influence of AI-based personalized learning on teacher motivation. The majority of participants indicated that AI technologies improved their professional confidence and encouraged them to adopt modern teaching methodologies. Teachers explained that AI-supported systems provided opportunities for creativity and instructional innovation within classroom environments. Many respondents also mentioned that AI integration motivated them to learn new digital skills and participate in professional development activities. In addition, teachers appreciated the flexibility and autonomy provided by AI-driven educational platforms. The findings demonstrate that AI-based personalized learning positively influences intrinsic and extrinsic motivation among university teachers.

**Theme 3: Professional Achievement through AI-Supported Learning Environments**

**Table 4.11 Theme 3: Professional Achievement and Academic Performance**

Sub-Themes	Participants' Responses
Improved teaching performance	Teachers reported better instructional effectiveness through AI support.
Research productivity	Participants explained that AI tools assisted them in academic research activities.
Time management	Respondents stated that AI systems improved efficiency and task management.
Professional recognition	Teachers mentioned receiving appreciation for technology-integrated teaching practices.

The third theme highlighted the role of AI-based personalized learning in improving teachers' professional achievement. Participants explained that AI-supported educational

systems enhanced their teaching performance by providing adaptive instructional tools and real-time student feedback. Several teachers stated that AI technologies also supported research activities through automated data analysis and academic resource management. Respondents emphasized that AI tools improved time management and reduced workload pressure, allowing greater focus on professional responsibilities. Some participants further mentioned receiving institutional recognition and appreciation for integrating innovative AI-supported teaching methods. These findings indicate that AI technologies contribute positively to teachers' professional growth and academic productivity.

**Theme 4: Challenges and Concerns Regarding AI Integration**

**Table 4.12 Theme 4: Challenges of AI-Based Personalized Learning**

Sub-Themes	Participants' Responses
Lack of training	Teachers reported insufficient institutional training programs for AI technologies.
Digital literacy issues	Participants mentioned difficulties in understanding advanced AI systems.
Ethical and privacy concerns	Respondents expressed concerns regarding data privacy and ethical AI usage.
Technological infrastructure limitations	Teachers highlighted limited digital resources and internet connectivity issues.

The fourth theme explored the challenges faced by university teachers regarding AI integration in higher education institutions. Most participants identified lack of training and technical support as major barriers to effective AI adoption. Teachers reported that many educators lacked sufficient digital literacy and technological competence to use advanced AI systems confidently. Ethical concerns related to data privacy, misuse of student information, and algorithmic bias were also highlighted during interviews. Furthermore, respondents from some institutions explained that limited technological infrastructure and poor internet connectivity negatively affected AI implementation. These findings suggest that institutional support, training programs, and technological resources are necessary for successful AI integration in higher education environments.

**4.8 Summary of Thematic Analysis**

The thematic analysis findings revealed that AI-based personalized learning positively influences university teachers' engagement, motivation, and professional achievement. Teachers perceived AI technologies as beneficial for improving classroom interaction, instructional planning, creativity, and academic productivity. AI-supported systems also enhanced teachers' confidence, autonomy, and professional development opportunities. However, several challenges such as lack of training, technological limitations, digital literacy issues, and ethical concerns were identified as barriers to effective AI integration. Overall, the qualitative findings strongly supported the quantitative results and confirmed the importance of AI-based personalized learning in transforming higher education teaching practices.

**5. Discussion**

The findings of this study revealed that AI-based personalized learning has a significant positive impact on university teachers' engagement, motivation, and professional achievement in higher education institutions. The quantitative results demonstrated strong positive relationships between AI-supported learning systems and teachers' professional experiences (Herzog et al., 2025). Similarly, the qualitative thematic analysis confirmed that university teachers perceive AI technologies as beneficial for improving instructional effectiveness, classroom interaction, and academic productivity. These findings are consistent with previous

studies that emphasized the role of AI technologies in transforming modern educational environments into adaptive and technology-supported learning ecosystems (Ghai et al., 2025).

The study found that AI-based personalized learning significantly enhanced teacher engagement. Teachers reported greater enthusiasm, active participation, and commitment toward instructional responsibilities when using AI-supported educational technologies. The findings suggest that AI tools reduced repetitive administrative tasks such as grading, attendance management, and assessment processes, allowing teachers to focus more on instructional creativity and student interaction (Ghai et al., 2025). This finding aligns with previous research indicating that AI-supported systems improve instructional efficiency and encourage innovative teaching practices in higher education. Furthermore, AI technologies enabled teachers to monitor students' progress in real time and provide personalized support according to individual learning needs, which strengthened teachers' involvement in classroom activities (Herzog et al., 2025).

The results also revealed that AI-based personalized learning positively influenced teacher motivation. Teachers expressed increased confidence, professional autonomy, and willingness to adopt modern teaching methodologies through AI integration. According to Self-Determination Theory, motivation increases when individuals experience autonomy, competence, and relatedness within professional environments (Hariyanto et al., 2025). The findings of this study support this theoretical perspective, as AI technologies provided teachers with opportunities for creativity, flexible instructional planning, and professional growth. Teachers reported that AI systems encouraged continuous learning, digital skill development, and participation in professional development activities. These findings are consistent with previous studies highlighting that educational technologies positively influence teachers' intrinsic and extrinsic motivation (Chiu, 2024).

Another important finding of the study was the positive effect of AI-based personalized learning on professional achievement. Teachers perceived AI-supported systems as useful tools for improving instructional performance, research productivity, academic management, and time efficiency (Afzaal et al., 2021). The quantitative analysis demonstrated significant positive relationships between AI integration and professional achievement, while interview participants explained that AI technologies helped them manage workload more effectively and improve academic performance. Teachers also reported receiving professional recognition for integrating innovative teaching methods into classroom practices. These findings suggest that AI-based personalized learning can contribute significantly to faculty development and institutional effectiveness in higher education (Farhood et al., 2025).

Despite these positive outcomes, the study also identified several challenges associated with AI integration in educational environments. Teachers reported concerns regarding lack of institutional support, inadequate technological infrastructure, insufficient training programs, and digital literacy limitations (Batool et al., 2025). Ethical concerns related to data privacy, algorithmic bias, and dependence on technology was also highlighted during interviews. These findings indicate that while AI technologies offer substantial educational benefits, successful implementation requires proper institutional policies, technological resources, and continuous teacher training programs. Similar concerns have been identified in previous international studies regarding the barriers to effective AI adoption in higher education institutions (Banihashem et al., 2025).

The mixed-methods approach used in this study provided comprehensive insights into the impact of AI-based personalized learning on university teachers. The quantitative findings offered statistical evidence of significant relationships among the variables, while the qualitative analysis provided deeper understanding of teachers' experiences, perceptions, and challenges (Chiu, 2024). The integration of both methods strengthened the validity and

reliability of the research findings. Overall, the study concludes that AI-based personalized learning has the potential to improve teachers' engagement, motivation, and professional achievement, provided that universities offer adequate technological support, training opportunities, and ethical guidelines for AI implementation (Batool et al., 2025).

## 6. Conclusion

Artificial Intelligence has become a transformative force in higher education by introducing adaptive, intelligent, and personalized learning environments that improve educational effectiveness and professional development. This study explored the impact of AI-based personalized learning on university teachers' engagement, motivation, and professional achievement using a mixed-methods research design. The findings of the study demonstrated that AI-supported educational technologies positively influence teachers' professional experiences and contribute significantly to instructional innovation in higher education institutions (Biswas & Molla, 2024).

The quantitative analysis revealed strong positive relationships between AI-based personalized learning and teacher engagement, motivation, and professional achievement. Teachers who actively used AI-supported educational systems showed higher levels of professional commitment, instructional effectiveness, and academic productivity. The findings also confirmed that teacher motivation played a mediating role between AI integration and professional achievement. These results indicate that motivated teachers are more likely to utilize AI technologies effectively and benefit from technology-enhanced teaching environments. The statistical findings were further supported by qualitative interview responses, where teachers explained how AI systems improved classroom interaction, lesson planning, teaching efficiency, and professional confidence (Fortuna, 2025).

The study also highlighted the importance of AI technologies in reducing administrative workload and supporting data-driven instructional practices. Teachers reported that AI-based personalized learning systems enabled them to monitor students' academic progress efficiently, provide immediate feedback, and design adaptive teaching strategies according to individual learning needs. These benefits contributed positively to teachers' engagement and motivation within academic settings. Furthermore, AI technologies encouraged professional creativity, continuous learning, and digital skill development among university teachers (Chang et al., 2023).

However, the study identified several barriers to effective AI integration in higher education institutions. Lack of institutional support, limited technological infrastructure, inadequate training programs, and insufficient digital literacy were major challenges reported by participants. Ethical concerns related to data privacy, algorithmic bias, and overdependence on technology also emerged as significant issues during qualitative interviews. These challenges suggest that successful AI implementation requires comprehensive institutional planning, teacher training, and clear ethical guidelines to ensure responsible and effective use of educational technologies.

The mixed-methods design of the study provided a holistic understanding of the research problem by combining statistical analysis with in-depth qualitative insights. This methodological integration enhanced the credibility and comprehensiveness of the findings.

The study contributes theoretically by extending existing knowledge related to educational technology, teacher motivation, and AI-supported learning environments. It also contributes practically by offering recommendations for policymakers, university administrators, and educational institutions regarding the effective integration of AI technologies into higher education systems (Almasri, 2024).

In conclusion, AI-based personalized learning has significant potential to improve teachers' engagement, motivation, and professional achievement in higher education

institutions. AI technologies can support innovative instructional practices, enhance academic productivity, and promote sustainable professional development among university teachers. However, the successful adoption of AI in education depends on institutional readiness, teacher training, technological infrastructure, and ethical implementation strategies. Therefore, universities should develop supportive educational environments that encourage effective AI integration while addressing the challenges associated with digital transformation in higher education.

## **7. Recommendations**

### **1. Faculty Training and Professional Development**

Universities should organize regular training programs and workshops to improve teachers' digital literacy and AI-related competencies. These training sessions should focus on the effective use of AI-based personalized learning systems in classroom teaching and academic management. Teachers must be provided with practical experience regarding AI tools and educational technologies. Continuous professional development programs can increase teachers' confidence and motivation toward AI adoption. Such initiatives will help faculty members integrate innovative teaching practices effectively in higher education environments.

### **2. Improvement of Technological Infrastructure**

Higher education institutions should invest in modern technological infrastructure to support AI integration in educational environments. Reliable internet connectivity, digital classrooms, AI-supported software, and technical resources should be made available to teachers and students. Universities should also establish technical support centers to assist teachers in solving technology-related issues. Improved infrastructure will reduce barriers to AI implementation and enhance the efficiency of teaching and learning processes. Adequate technological facilities are essential for successful digital transformation in higher education.

### **3. Development of Ethical AI Policies**

Educational institutions should develop clear policies and ethical guidelines regarding the use of AI technologies in teaching and learning activities. These policies should address issues related to data privacy, security, algorithmic bias, and responsible AI usage. Teachers and students should be informed about ethical practices and digital safety measures within AI-supported educational systems. Universities should also monitor AI implementation to ensure fairness, transparency, and accountability in academic environments. Ethical policies will increase trust and confidence in AI technologies among educators.

### **4. Encouragement of Research and Innovation**

Universities should encourage teachers to participate in research activities related to artificial intelligence and educational technology. Research grants, collaborative projects, and innovation programs should be introduced to promote AI-based instructional practices and academic innovation. Teachers should be motivated to explore new educational methodologies and publish research regarding AI integration in higher education. Such initiatives will contribute to academic excellence and institutional development. Encouraging research and innovation can strengthen universities' competitiveness in the digital era.

### **5. Promotion of Collaborative Learning Environments**

Higher education institutions should create collaborative and technology-supported learning environments that encourage interaction among teachers, students, and academic departments. AI-based platforms should be used to support teamwork, communication, and knowledge sharing within educational settings. Collaborative learning environments can enhance teachers' engagement, creativity, and professional satisfaction. Universities should also promote interdisciplinary cooperation in implementing AI-supported teaching practices.

Strong collaboration among stakeholders will improve the overall effectiveness of AI integration in higher education institutions.

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