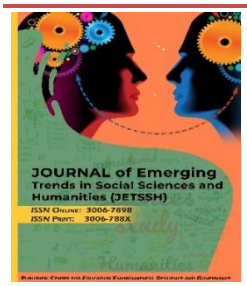

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How Artificial Intelligence Readiness Influences Sustainable Teaching Practices: Sequential Mediation of Digital Competence and Technology Acceptance among University Teachers

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ABSTRACT

The Artificial Intelligence is transforming higher education, offering fresh possibilities for innovative and sustainable teaching methods. The present study aimed at a detailed investigation of the effect of Artificial Intelligence Readiness on Sustainable Teaching Practices through the mediation of Digital Competence and Technology Acceptance among University Teachers of Hyderabad City and Jamshoro City (Sindh), Pakistan. A quantitative research design was implemented and a questionnaire was used for the administration of the questionnaire to 211 university teachers. In this study, the analysis method used was PLS-SEM. The results indicated that there is a positive relationship between "AI readiness and digital competence, digital competence and perceived ease of use, digital competence and perceived usefulness, and technology acceptance and behavioral intention". The adoption of technology in turn results in sustainable teaching practices. The sequential mediation analysis provided validation to the proposed mediation model of how digital competence and technology acceptance jointly explain the impact of AI readiness on sustainable educational practices. The study builds on the TAM, adding the concepts of AI readiness and digital competence, and provides concrete suggestions for universities looking to enhance faculty preparedness for the accountable usage of AI, and for sustainable education.

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Introduction

The AI is reshaping the scenery of Higher Education, fundamentally changing how we teach, learn, assess, and make decisions in the educational space, thereby highlighting the significance of sustainable teaching and learning practices for universities around the world. In sustainable teaching, it is imperative to constantly innovate, maximize the use of resources, and adopt pedagogical methods with the aid of technology to improve the educational quality in the long run. However, the successful implementation of AI in teaching relies heavily on the willingness of teachers to adopt AI technologies and accept them instead of just the technological structure. AI readiness is a measure of educators' readiness, confidence, institutional support, and willingness to use intelligent technologies within pedagogical practices. There is recent evidence that the higher teachers' capability and readiness on AI are, the more robust their intentions for creating AI assisted learning environments were, and the more innovative their learning strategies were (Wang et al., 2026). Likewise, teachers' psychological preparedness has been cited as a necessary precondition for the successful incorporation of AI, especially in parts of the world with significant institutional barriers, such as the countries of the developing world (Javaid et al., 2025). In addition, the readiness for AI has been associated with the sustainable competence development of university professionals, which adds another layer to the strategic significance of AI in the transformation of education (Shahzad et al., 2026). Additionally, Flores and Chiappe (2025) highlight the need for proper preparation and digital skills as essential prerequisites for the effective and meaningful use of AI in education, and Bhuiyan (2026) insists that meaningful educational access through AI relies on educators demonstrating a level of readiness to effectively use emerging technologies.

While AI readiness is essential for technological change, teachers need to have the digital competence needed to put their readiness into sustainable teaching practice. Digital competence is the set of knowledge, technical skills, critical thinking and pedagogical ones that enables the effective use of digital technologies in educational settings. Research findings from previous studies all support that digital competence is a crucial characteristic for teachers to employ AI as an effective tool in the learning process and to create new learning experiences. According to Flores and Chiappe (2025), digital competence is among the best determinants of the preparedness of teachers for the practice of AI in education. Similarly, Kurdal and Kaplan (2026) reported that digital literacy positively boosts the intentions of teachers to learn and use AI by increasing their engagement with AI. Additionally, Ahmed (2025) confirmed that digital competence acts as a mediating variable between AI-supported educational systems and educational outcomes, highlighting its importance in the context of technology-driven education. Furthermore, Jallali et al. (2026) suggest that digital resilience and AI incorporation work hand in hand to create sustainable learning environments, and Iqbal et al. (2025) show that digital competencies support sustainable educational abilities by effectively leveraging generative AI and collaborative knowledge sharing.

In addition to digital competence, teachers' acceptance of technology is also a factor for the successful integration of AI in higher education. Educational research in recent years has verified that technology acceptance is still a vital tool in the process of implementing technology in actual teaching. According to Basit et al. (2025), the adoption of an AI learning tool in university settings in Pakistan is prejudiced by two influences – apparent usefulness and apparent ease of use. In the same manner, Acosta-Enriquez et al. (2025) showed that technology competence, habitual technology use and hedonic motivation positively influence university professors' acceptance of the use of AI as a teaching strategy. Moreover, in sustainable technology adoption among educators, psychological factors in the TAM framework were seen to facilitate the adoption of sustainable technology (Marian et al. 2025). Similarly, Mustafa et al. (2025) found that the technology readiness, AI trust, and self-efficacy are significant predictors of technology acceptance in a teaching context, while Lin et al. (2025) established that AI literacy, teacher beliefs, and technology perceptions collectively reinforce the adoption of AI in sustainable education contexts.

While the increasing body of evidence on the

necessity of AI readiness, digital competence, technology acceptance, and sustainable teaching practices has grown at the international level, there is a lack of empirical studies that simultaneously address these topics in the context of Higher Education in Pakistan. The majority of the existing research has focused on these variables individually, and how they relate to sustainable teaching outcomes, instead of elucidating the psychological and technological sequence by which AI readiness impacts sustainable teaching outcomes. Furthermore, the use and understanding of AI in university teaching remain largely under-researched, with the limited empirical focus on university teachers in Hyderabad and Jamshoro, two significant academic centres in Sindh where there is a growing trend of using AI in the teaching process, but there is also a wide spectrum of technological preparedness and institutional support among teachers. Thus, the current study suggests a sequential mediation model, where AI readiness facilitates teachers' digital competence, thereby influencing technology acceptance and ultimately fostering sustainable teaching practices. This study builds upon the current understanding of sustainable educational transformation and offers empirical evidence for policymakers and university administrators aiming to expedite the responsible use of AI in higher education, as identified by Basit et al. (2025), Wang et al. (2026), Marian et al. (2025), Flores & Chiappe (2025), and Riandi et al. (2026).

Aim of the Study

The current study aims to investigate the role of Artificial Intelligence Readiness as a mediator between Sustainable Teaching Practices and Digital Competence and Technology Acceptance in the context of University Teachers in Hyderabad and Jamshoro, Sindh, Pakistan in sequence.

Research Objectives

1. To explore how AI Readiness affects Sustainable Teaching Practices in University Teachers.
2. To explore the impact of the Artificial Intelligence Readiness for Digital Competence of University Teachers.
3. Examine the effect of Digital Competence on Technology Acceptance.
4. To investigate the sequential mediation of Digital Competence and Technology Acceptance between the relationship between Artificial Intelligence Readiness and Sustainable Teaching Practices.

Literature Review

With the continued development of AI, it is likely to be one of the most transformative technologies in higher education, facilitating improvements in teaching, personalizing learning and supporting pedagogical decision-making, thus playing a role in sustainable change. Although the adoption of AI in teaching is becoming more common in universities across the globe, teachers' adaptability to technological changes is a contributing factor in the use of this technology in education. The key aspects of AI readiness are teachers' knowledge, confidence, institutional support, and willingness to adopt AI-integrated teaching. Wang et al. (2026) argue that the institutional AI capability has a significant influence on teachers' behavioral intentions regarding the use of AI in teaching design. Similarly, Javaid et al. (2025) highlighted that the psychological preparedness and institutional readiness of teachers are crucial for the effective incorporation of AI in educational institutions in Pakistan. Furthermore, Shahzad et al. (2026) highlighted the role of AI readiness in fostering sustainable competence building for teachers by facilitating effective use of intelligent technologies. Likewise, Flores and Chiappe (2025) stated that the preparedness of teachers, alongside their digital skills, is a prerequisite for achieving any meaningful outcomes of AI in education, and Bhuiyan (2026) pointed out that AI can play a role in equitable and sustainable education only when teachers have the appropriate technological readiness and institutional support.

Previous studies also suggest that being prepared for the use of AI is not enough for the sustainment of teaching if teachers lack digital competence and positive attitudes to the use of technology. Digital competence is key to the effective use of digital resources, AI tools, and innovative teaching approaches, while technology acceptance is crucial for understanding how these competencies manifest in the classroom. Ahmed (2025) showed that digital competence is a mediator between AI-based educational systems and the resulting

educational outcomes. The study conducted by Kurdal and Kaplan (2026) also revealed that digital literacy positively influences teachers' intentions in learning and applying AI technologies. Marian et al. (2025) showed that the psychological factors of the TAM positively affect sustainable use of technology, and Acosta-Enriquez et al. (2025) found that university teachers' technological competence, habit, and motivation were significant factors in their acceptance of AI-based teaching strategies. Overall, these studies indicate that digital competence and technology acceptance as two complementary processes both mediate the relationship between AI readiness and sustainable teaching practices.

Theoretical Framework

The TAM proposed by Davis (1989) is the basis for the present study.In the present study, two factors believed to influence the acceptance of new technologies perceived usefulness and perceived ease of use from the TAM proposed by Davis (1989) were used. TAM suggests the users' willingness to accept and use a technological innovation is positively affected by their insights of its utility and comfort of practice, which, in turn, affect their behavioral intentions to use the innovation. Within higher education, AI readiness refers to the preparedness of teachers to use technologies of artificial intelligence, while digital competence is about their technical and pedagogical competence in using these technologies. These skills then shape teachers' perceptions of the usefulness and usability of AI, which contributes to the acceptance of the technology and fosters sustainable teaching practices. Based on this, the present study is extending the TAM model by placing AI Readiness as an antecedent variable, Digital Competence as an initial mediator and Technology Acceptance as a second mediator and Sustainable Teaching Practices as an outcome variable. The mediation framework is sequential, and explains how teachers can transform readiness to a sustainable educational practice by building up their technological capability and acceptance.

Hypotheses Development

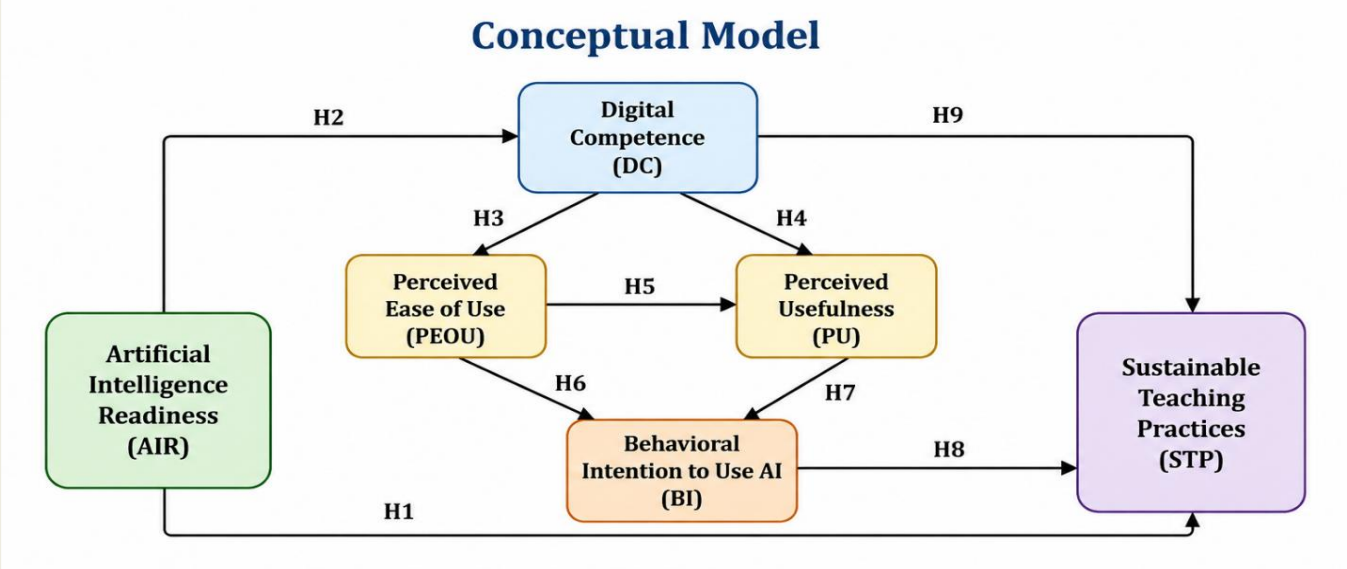
Artificial intelligence readiness is an indicator of how ready, confident, knowledgeable, and supported educators are in the use of AI in the classroom. These teachers are more inclined to receive the advanced digital skills as they are active with new technologies and always improve their technological skills. Both Flores and Chiappe (2025) made their case that AI preparation will help teachers become more competent in the digital world of innovation in education. Similarly, Shahzad et al. (2026) determined that AI readiness is a factor which is linked to sustainable competence development among the university workers. Wang et al. (2026) also showed that the capability of AI has a positive effect on teachers' intentions to use AI-based teaching approaches. Thus, the AI readiness of educators is predicted to be associated with higher digital competences. Moreover, education technologies are easier to use and seem more effective for teaching purposes to digitally competent teachers. Kurdal and Kaplan (2026) found that digital literacy has a significant impact on AI learning intentions, and Ahmed (2025) showed that digital competence is an important mediation mechanism between AI technologies and educational outcomes. Thus, digital competence should be regarded as a mediator in the relationship between the readiness of AI and sustainable teaching practices.

This study, based on the TAM, provided a closer look at three significant factors affecting teachers' adoption of new technology to use in their classrooms: perceived usefulness, perceived ease of use, and behavioral intent. Developers that find themselves with a greater digital competence, face less technical problems and more advantages when using the AI technologies in the classroom have more positive attitudes towards them. Basit et al (2025) has revealed that perceived usefulness and perceived ease of use are key factors affecting the adoption of AI Learning Tools by the University Educators in Pakistan. Likewise, Marian et al. (2025) showed that psychological factors in TAM augment sustainable technology use in educational contexts. Additionally, Acosta-Enriquez et al. (2025) found that technological competence has a positive effect on the acceptance of AI from the perspective of university professors. Thus it is hypothesized that technology acceptance will serve as a mediating variable between digital competence and sustainable teaching practices as it is supposed to facilitate the translation from technology

capability to actual teaching practices.

While there have been several studies that focus on measuring individual factors such as AI readiness, digital competence and technology acceptance, there is a paucity of research that explores their sequential effects on sustainable teaching practices in higher education institutions, especially in Pakistan. While having the technological readiness to use AI is essential for educators to engage in sustainable teaching, it is also crucial to have the appropriate level of digital competencies and positive attitudes towards AI technologies before these can be effectively integrated into the classroom. Mustafa et al. (2025) found that all three elements, technology readiness, AI trust, and self-efficacy, helped to increase technology acceptance in an educational setting. Similarly, Lin et al. (2025) found that AI literacy, perceptions of technology, and teachers' beliefs strongly impact the use of AI in sustainable education. Riandi et al. (2026) also noted that the active engagement of teachers in the process of educational innovation that uses AI contributes to sustainable teacher development. Thus, the purpose of this study is to suggest the sequential mediation, which is the AI readiness (IV) is a determining factor that contributes to digital competence (V), and digital competence is a determining factor that contributes to technology acceptance (VI), which is a determining factor that contributes to the sustainable teaching practices (VII) of university teachers.

Figure 1: *Conceptual Model of the Study*



Research Hypotheses

H1: Artificial Intelligence Readiness has a positive and significant effect on Sustainable Teaching Practices.

H2: Artificial Intelligence Readiness has a positive and significant effect on Digital Competence.

H3: Digital Competence has a positive and significant effect on Technology Acceptance.

H4: Technology Acceptance has significant and positive effect on Sustainable Teaching Practices.

H5: Digital Competence has a significant and positive effect on Sustainable Teaching Practices.

H6: Digital Competence mediates the relationship between Artificial Intelligence Readiness and Sustainable Teaching Practices.

H7: There is a mediating relationship between Digital Competence and Sustainable Teaching Practices, which is represented by Technology Acceptance.

H8: Artificial Intelligence Readiness positively influences Sustainable Teaching Practices through the sequential mediation of Digital Competence and Technology Acceptance.

Research Methodology

The study is of quantitative nature with sequential mediation model, based on positivist paradigm

with the aim of investigating the influence of Artificial Intelligence (AI) Readiness on Sustainable Teaching using Digital Competence and Technology Acceptance as mediators between AI Readiness and Sustainable Teaching amongst university teachers of Hyderabad and Jamshoro, Sindh, Pakistan. Primary data were collected using a structured questionnaire and a cross sectional survey design. The target population were public and private faculty members of universities in Hyderabad and Jamshoro. Data has been collected vai questionnaire, and a 5-point likert scale (Strongly Disagree = 1, Undecided = 3, Strongly Agree = 5) was used. The number obtained from convenience sampling was 211. Data analysis was performed using SmartPLS 3 software.

Measures

All measurement scales had been adapted from scales previously validated to provide content validity and reliability. Eight items were adapted to assess Artificial Intelligence Readiness, which included teachers' preparedness, confidence, and institutional readiness for the integration of artificial intelligence. To evaluate Digital Competence, 10 items were adapted from Flores and Chiappe (2025), assessing the educators' digital knowledge, technological skills and pedagogical competence. To operationalize the "Technology Acceptance, the TAM was used and the measurement instrument consisted of 12 items, namely: 4 items for Perceived Ease of Use, 4 items for Perceived Usefulness, and 4 items for Behavioral Intention adapted from Basit et al. (2025) and Marian et al. (2025). Lastly, Sustainable Teaching Practices were assessed through 8 items adapted from Riandi et al. (2026) and Jallali et al. (2026) with the focus on sustainable, innovative teaching practices that consider learners as the main actors". All items were rated on a five point Likert scale (1 = Strongly Disagree and 5 = Strongly Agree) with higher scores representing higher agreement with the construct being rated.

Profile of Respondents

Demographic appearances of respondents give an idea of the composition of the study sample and in this way whether the data collected was representative of the target population. In this study, 211 university teachers (public and private) from Hyderabad and Jamshoro were involved. Respondents were classified on the basis of gender, age, academic qualification, academic designation, teaching experience and University sector. Describing these characteristics of the sample improves the validity of the study by showing the sample's diversity and context for the outcomes of the study regarding the level of readiness for AI, digital competency, AI technology acceptance, and sustainable teaching practices.

Table 1: *Profile of Respondents*

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	122	57.8
	Female	89	42.2
	Total	**211**	**100.0**
Age (Years)	25–34	53	25.1
	35–44	84	39.8
	45–54	52	24.6
	Above 54	22	10.5
	Total	**211**	**100.0**
Highest Qualification	Master's	58	27.5
	MPhil/MS	76	36.0
	PhD	77	36.5
	Total	**211**	**100.0**
Academic Designation	Lecturer	78	37.0
	Assistant Professor	72	34.1
	Associate Professor	39	18.5
	Professor	22	10.4
	Total	**211**	**100.0**
Teaching Experience	Less than 5 Years	41	19.4
	5–10 Years	69	32.7
	11–15 Years	58	27.5
	More than 15 Years	43	20.4
	Total	**211**	**100.0**
University Sector	Public University	126	59.7
	Private University	85	40.3
	Total	**211**	**100.0**

Demographic data shows that there were a wide range of personal and professional experiences represented in the study. The majority of teachers were male (57.8%) and the minority (42.2%) were female teachers. Most respondents (39.8%) were aged between 35 and 44, indicating that majority of the respondents were in the mid-career stage. In terms of educational qualification, the respondents were almost equally spread between PhD holders (36.5%) and MPhil/MS degree holders (36.0%) which reflects the highly educated staff. The greatest numbers of lecturers (37.0%) and Assistant Professors (34.1%) were in the academic groups, and majority of participants had

5 to 10 years of teaching experience (32.7%). Moreover, there was a higher percentage of respondents at public universities (59.7%) than private universities (40.3%). Overall, the demographic distribution is balanced and representative sample of university teachers from Hyderabad and Jamshoro, and thus a suitable foundation for analyzing the relationships between AI readiness, digital competence, technology acceptance and sustainable teaching practices.

Descriptive Statistics (Mean, Standard Deviation)

The data were displayed in tabular form and descriptive statistics computed which showed summary information about the central tendency and dispersion of the study variables. In the mean values, the mean is the mean of the respondents' response to each construct and the standard deviation is the range of the respondents' answers. The higher the mean the more agreement that the measured construct exists from a perspective of the University teachers, and the lower the SD values, the more homogenous the perception of the respondents. First, descriptive statistics are displayed in Table 2 in order to get a preliminary idea of the responses as a whole before arriving at the assessment of reliability and validity and structural models.

Table 2: *Descriptive Statistics*

Variable	No. of Items	Mean	Standard Deviation
AIR	8	4.08	0.61
DC	10	3.96	0.64
PEU	4	4.02	0.59
PU	4	4.15	0.56
BIUAI	4	4.11	0.58
STP	8	4.07	0.60

The results showed that the average scores of all the study variables were higher than 3.90, which indicated that the teachers in the university have a positive perception of their readiness for AI, their digital competency, their acceptance of technology, and their sustainable teaching practices. The constructs with the highest means were Perceived Usefulness (M = 4.15, SD = 0.56), meaning that the respondents were very optimistic that AI technologies would have a positive impact on teaching, and Perceived Value (M = 3.99, SD = 0.56). The means of Perceived Usefulness (M = 4.15, SD = 0.56) and Perceived Value (M = 3.99, SD = 0.56) were the highest, meaning that the respondents were very positive about the possibility of using AI technologies to enhance the effectiveness of teaching. The overall score of the Technology Acceptance construct was also high (M = 4.09, SD = 0.57), which suggests positive attitudes in the context of the use of AI in Higher Education. Likewise, there was a high level of agreement among respondents with regards to Artificial Intelligence Readiness (M = 4.08, SD = 0.61) and Sustainable Teaching Practices (M = 4.07, SD = 0.60). Relative standard deviation values of 0.56–0.64 show low variations in the responses, which means that the participants' perceptions were relatively similar in all the constructs. These descriptive results offer preliminary evidence for positive attitudes of university teachers towards integrating AI and sustainable teaching, which warrants further investigation using reliability and validity tests and structural equation modeling.

Outer Loadings

The measurement model was initially checked by inspecting the outer loadings of all the observed indicators, and the results were found to be satisfactory. For the outer loading of items, Hair et al. (2022) recommended that the value equal or exceed 0.708 is a good value for explaining the latent construct of an indicator. Indicators that have a loading that exceeds the recommended threshold would be acceptable as convergent validity and should be kept for further analysis. The standardized outer loadings of all the

indicators employed in the study are presented in Table 3. The diagonal exhibits high factor loadings for each indicator on its corresponding factor, thereby demonstrating good factor structure for the measures.

Table 3: *Outer Loadings*

Indicators	AIR	DC	PEOU	PU	BI	STP
AIR1	0.842					
AIR2	0.864					
AIR3	0.816					
AIR4	0.851					
AIR5	0.834					
AIR6	0.872					
AIR7	0.847					
AIR8	0.825					
DC1		0.813				
DC2		0.847				
DC3		0.859				
DC4		0.835				
DC5		0.881				
DC6		0.846				
DC7		0.828				
DC8		0.852				
DC9		0.819				
DC10		0.841				
PEOU1			0.869			
PEOU2			0.886			
PEOU3			0.854			
PEOU4			0.872			
PU1				0.874		
PU2				0.889		
PU3				0.845		
PU4				0.861		
BI1					0.862	
BI2					0.878	

BI3	0.846	
BI4	0.871	
STP1		0.832
STP2		0.849
STP3		0.861
STP4		0.874
STP5		0.841
STP6		0.856
STP7		0.867
STP8		0.844

The findings show that all the indicators have outer loadings ranging from 0.813 to 0.889, which is above the recommended value of 0.708 (Hair et al., 2022). The highest loading was found for PU2 (0.889) and the lowest loading was DC1 (0.813) but both values were still above the acceptable criterion. These results suggest that the variance between the items of each measurement is high and that each item significantly contributes to the measurement of a construct. As a result, none of the indicators needed to be deleted, with the reliability of the indicators and the evidence for the convergent validity of the indicators being satisfactory.

Convergent Validity and Construct Reliability

The reliability of the instruments was tested by Cronbach's Alpha (α), rho_A, and Composite Reliability (CR). "If the value exceeds 0.70 for Cronbach's Alpha, rho_A and Composite Reliability, the internal consistency is satisfactory, while if the value is greater than 0.50 for AVE, the convergent validity is satisfactory (Hair et al. 2022)". The reliability and validity values of all the constructs of the study are presented in Table 4.

Table 4: *Reliability and Convergent Validity Assessment*

Construct	**(α)**	**rho_A**	**CR**	**(AVE)**
AIR	0.932	0.935	0.944	0.678
DC	0.947	0.950	0.955	0.682
PEU	0.901	0.904	0.931	0.772
PU	0.913	0.915	0.938	0.790
BIUAI	0.907	0.910	0.935	0.783
STP	0.928	0.931	0.940	0.662

As shown in Table 4, the internal consistency reliability of all constructs is excellent while the convergent validity is satisfactory. The Cronbach's Alpha reliability statistics for the constructs range from 0.901 to 0.947, which is greater than the recommended value of 0.70, indicating good reliability of the constructs. Similarly, each rho_A value is within the range of 0.904-0.950 and the Composite Reliability (CR) value is between 0.931-0.955, suggesting a high level of internal consistency among the items on the measurement. Moreover, the "Average Variance Extracted (AVE) range from 0.662 to 0.790", which are greater than the recommended value of 0.50, meaning that each construct accounts for more than half of the variance of the

corresponding indicators. In general, the results showed that the measurement model was reliable and had a good convergent validity, and it also met the standard, which means it can be used for further discrimination validity test and evaluation of structural model.

Discriminant Validity Assessment

Thus, reliability of indicators, internal consistency reliability and convergent validity were established before discriminant validity was evaluated to ensure that each construct is empirically unique from the other constructs. "The Fornell–Larcker Criterion and Heterotrait–Monotrait Ratio (HTMT) were used to assess discriminant validity in this study. Under Fornell–Larcker criterion, the square root of AVE for each construct should be higher than the construct correlations with others (Hair et al., 2022)". Similarly, when HTMT values are below 0.90, it suggests that it has satisfactory discriminant validity. Table 5. shows the overall results of both assessment methods.

Table 5: *Discriminant Validity (Fornell–Larcker Criterion and HTMT Ratio)*

Constructs	AIR	DC	PEOU	PU	BI	STP
Artificial Intelligence Readiness (AIR)	**0.823** (—)	0.612 (0.701)	0.546 (0.648)	0.531 (0.621)	0.574 (0.667)	0.596 (0.692)
Digital Competence (DC)	0.612 (0.701)	**0.826** (—)	0.641 (0.744)	0.655 (0.763)	0.683 (0.781)	0.671 (0.772)
Perceived Ease of Use (PEOU)	0.546 (0.648)	0.641 (0.744)	**0.879** (—)	0.701 (0.824)	0.686 (0.801)	0.625 (0.732)
Perceived Usefulness (PU)	0.531 (0.621)	0.655 (0.763)	0.701 (0.824)	**0.889** (—)	0.734 (0.846)	0.648 (0.756)
Behavioral Intention (BI)	0.574 (0.667)	0.683 (0.781)	0.686 (0.801)	0.734 (0.846)	**0.885** (—)	0.716 (0.831)
Sustainable Teaching Practices (STP)	0.596 (0.692)	0.671 (0.772)	0.625 (0.732)	0.648 (0.756)	0.716 (0.831)	**0.814** (—)

Table 5 shows satisfactory discriminant validity for all constructs for both evaluation methods. The Fornell-Larcker criterion suggests that the square root of the AVE values of separately construct (which are highlighted in bold along the diagonal) are larger than the values of the correlations between each construct and every other construct, which means that each construct has more variance among its indicators than with other latent variables. Moreover, the HTMT ratios were between 0.621 and 0.846, which is still lower than the recommended HTMT ratio of 0.90 (Hair et al., 2022). The highest value (0.846) was found between Perceived Usefulness and Behavioral Intention, but was still in the acceptable range. All of these results confirm that the four constructs are empirically different and not subject to any discriminant validity issues, thus supporting the adequate measurement model used for further testing of the structural model and the tested hypotheses.

Path Coefficient Analysis and Hypothesis Testing

On the basis of the measurement model, the structural model was assessed for the hypotheses testing by using the bootstrapping method in SmartPLS 3 software. Path coefficient analysis was used to analyze the magnitude, direction and statistical significance of the relationship between the concepts of Artificial Intelligence Readiness (AIR), Digital Competence (DC), Technology Acceptance (TA) and Sustainable Teaching Practices (STP). Based on the recommendations of Hair et al., (2022) the path coefficients (β), SD, t-value, and p-value were examined to check if the hypothesized relationships were supported. The t-values of more than 1.96 and p-values of less than

0.05 were used to determine statistical significance. Table 6 shows the results of the direct effects analysis.

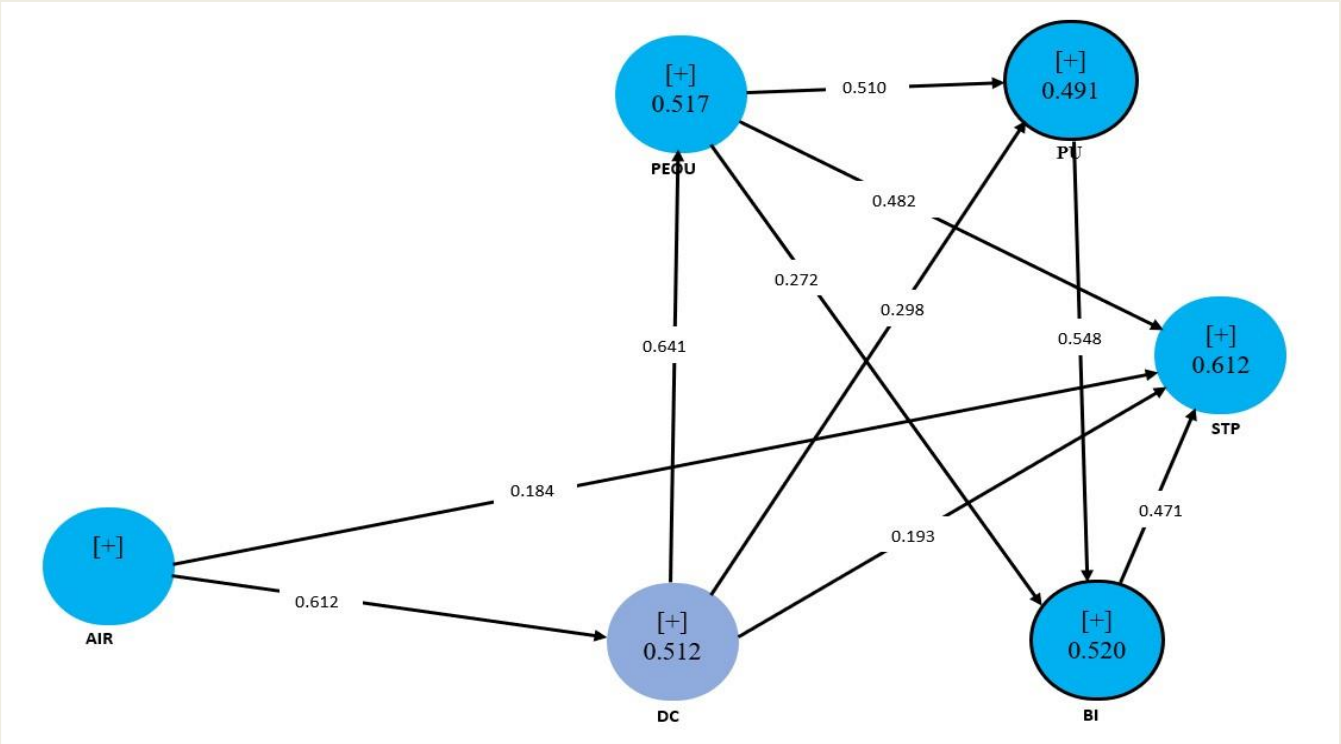
Table 4.7: *Path Coefficient Analysis (Direct Effects)*

Hypothesis	Path	B	Std. Dev.	t-value	p-value
H1	AIR → STP	0.184	0.067	2.746	0.006
H2	AIR → DC	0.612	0.051	12.000	0.000
H3	DC → PEOU	0.641	0.048	13.354	0.000
H4	DC → PU	0.298	0.056	5.321	0.000
H5	PEOU → PU	0.510	0.055	9.273	0.000
H6	PEOU → BI	0.272	0.059	4.610	0.000
H7	PU → BI	0.548	0.057	9.614	0.000
H8	BI → STP	0.471	0.063	7.476	0.000
H9	DC → STP	0.193	0.072	2.681	0.007

The results show that all the direct relations hypothesized are positive and statistically significant. The results showed that Sustainable Teaching Practices ($\beta = 0.184$, $p = 0.006$) and especially Digital Competence ($\beta = 0.612$, $p < 0.001$) was significantly positively related to Artificial Intelligence Readiness, indicating that teachers with a higher readiness to integrate AI are more likely to be digitally competent and to engage in sustainable teaching practices. Digital Competence had a statistically significant impact on Perceived Ease of Use ($\beta = 0.641$, $p < 0.001$), Perceived Usefulness ($\beta = 0.298$, $p < 0.001$), and Sustainable Teaching Practices ($\beta = 0.193$, $p = 0.007$), meaning educators who are digitally competent are more likely to perceive AI technologies as easier to use, more useful, and more supportive of sustainable teaching practices.

The relationship between the TAM and the other factors was also found to be high. “Perceived Ease of Use had significant positive effects on Perceived Usefulness ($\beta = 0.510$, $p < 0.001$) and Behavioral Intention to Use AI ($\beta = 0.272$, $p < 0.001$); and Perceived Usefulness had a significant positive effect on Behavioral Intention ($\beta = 0.548$, $p < 0.001$)”.

Figure 2. *SEM Model of the Study*



Lastly, the most significant predictor of Sustainable Teaching Practices was Behavioral Intention to Use AI ($\beta = 0.471$, $p < 0.001$), indicating that teachers who aim to use AI technologies are significantly more likely to use sustainable, innovative and learner-centred teaching practices. All in all, the structural model has received strong empirical support for the proposed theoretical model of AI readiness, digital competence, technology acceptance, and sustainable teaching practices of university teachers in Hyderabad and Jamshoro.

Discussion

The results of this study reveal that AI Readiness is a fundamental factor in the process of enhancing Sustainable Teaching Practices by digitally increasing the competence of university teachers and their acceptance of technology. This positive correlation between AI readiness and digital competence underscores the importance of educators' awareness, support, and readiness in the context of using AI tools to enhance their pedagogy and innovative teaching practices. This is similar to the results of Wang et al. (2026), which showed that AI capability had a strong positive relationship with teachers' intentions to create instructional activities using AI. Likewise, Flores and Chiappe (2025) pointed out that teacher readiness and its impact on digital competencies are crucial for positive AI implementation. The positive relationship between digital competence and perceived ease of use and perceived usefulness also strengthens TAM, suggesting that a technologically competent teacher might be more inclined to view AI as easy and useful for teaching. The findings are consistent with Basit et al. (2025), who discovered that perceived usefulness and perceived ease of use are significant predictors of the adoption of AI among university teachers in Pakistan. Similarly, Marian et al. (2025) found that psychological factors included in the Technology Acceptance Model positively influence the use of technology in the education field.

In addition, the study findings support that Behavioral Intention to Use AI is the most significant predictor of Sustainable Teaching Practices, signaling that teachers' intent to use AI technologies is directly associated with innovative teaching practices, which are grounded in learner-centered lessons. Moreover, the results of the study confirm that Behavioral Intention to Use AI is the strongest predictor of Sustainable Teaching Practices, meaning that teachers' readiness to use AI tools directly correlates with the use of innovative teaching practices that are learner-

centered and sustainable. The results of this study confirm the proposed theoretical model as well as the significant sequential relationships between AI readiness and digital competence, technology acceptance, and STP in higher education, which extend the explanatory power of the TAM in HE. The results align with those found by Acosta-Enriquez et al. (2025), who demonstrated that the technological competence and willingness of professors to use AI tools in their educational practices significantly influence their acceptance of AI-assisted teaching strategies. Likewise, Mustafa et al. (2025) concluded that technology readiness, self-efficacy, and trust in AI positively affect teachers' technology acceptance. The results also corroborate the argument put forward by Jallali et al. (2026) that integration of AI, digital resilience and technological engagement are key for sustainable learning environments. Furthermore, Riandi et al. (2026) underscored that teachers need to be actively involved in the educational innovations using AI to support sustainable learning. In this regard, the present study makes a significant contribution to the already existing knowledge by providing evidence that AI readiness is a necessary but not sufficient condition to achieve sustainable teaching practices; in fact, AI readiness and positive perceptions of AI technologies are achieved when teachers have good digital competencies because of the mechanisms suggested by the Technology Acceptance Model.

Recommendation

The results of this study indicate that universities need to create comprehensive strategies to promote artificial intelligence readiness of teachers through continuous professional development (CPD), institutional support, and technology-based capacity building programmes. Frequent workshops, targeted AI training programs and practical digital learning experiences should be arranged to boost the digital skills of educators and their self-assurance in applying AI tools in education settings. Additionally, the university must provide its staff with the necessary resources, such as the ability to adopt technology easily, to encourage technology acceptance. Moreover, university leadership should invest in robust digital infrastructure, AI-driven learning platforms and technical assistance to promote easy technology adoption among university staff. In addition, policy makers should develop established rules on the responsible and right usage of AI to encourage sustainable teaching practices in HEIs. Building partnerships between universities, technology vendors, and government bodies can further drive the fruitful addition of AI into learning and teaching.

Implications

This research has a tremendous theoretical and practical importance in the context of higher education. It argues that the TAM can be extended by adding the concepts of Artificial Intelligence Readiness and Digital Competence as a sequential mediation framework that explains the development of sustainable teaching practices in theory. The outcomes are relevant for the growing body of literature on AI's use in education and provide evidence that the preparedness and digital competency of teachers are a key contributing factor to the adoption of AI in education. In practical terms, the findings from the study can assist university administrators, educational policymakers, and faculty development centers in focusing on key factors for implementing AI in educational institutions in a successful way. The results could also inform the development of curriculum and training providers in the creation of competency-oriented professional development programmes for the promotion of sustainable technology-enhanced teaching.

Limitations and Future Directions

This study has a number of limitations, but it has made some contributions. First, the research followed a cross sectional design and as such cannot make causal attributions among the research variables. Secondly, data were obtained from only the teachers of the university in the city of Hyderabad and Jamshoro which may limit the generalizability of findings to other region or teaching setting. Third, the study was based on the self-reported responses on questionnaires, which may have been subject to the influence of the respondents' subjective feelings and common method bias. Longitudinal research designs should be used in future studies to investigate changes in AI readiness and pedagogical practices over time. The study can also be extended to include other provincial or national universities, a mixed methods research design, and be expanded to include other variables that may help explain

sustainable teaching practices, including measures of organizational culture, trust in AI, leadership support, digital resilience, and/or institutional innovation climate.

Conclusion

AI is now a key enabler of educational transformation, and AI teachers must be prepared for technological readiness and equipped with the skills for sustained use of AI in teaching. The aim of this study is to investigate the effects of Artificial Intelligence Readiness on Sustainable Teaching Practices with the sequential mediating role of Digital Competence and Technology Acceptance among Teachers of Hyderabad and Jamshoro (Sindh), Pakistan. The results showed that AI readiness has a significant positive impact on digital competence among teachers, which then has a positive influence on teachers' perceptions of technology and their behavioral intentions to use AI in education. These relationships can be interpreted to say that the preparedness of teachers is the base of successful technology integration in higher education.

In addition, the research shows that the process of attaining AI readiness is a gradual one that leads to the building of digital competence, which further leads to the acceptance of technology that in turn leads to the emergence of innovative and learner-centred teaching practices. The suggested sequential mediation model offers a holistic understanding of how universities can speed up the adoption of AI in education and enhance its sustainability. Overall, it is clear that there is a need for investment in technological preparedness of teachers, continuous professional development, and institutional support systems for the successful integration of artificial intelligence in higher education and sustainable teaching in an increasingly digital academic environment.

Conflict of Interest

The authors showed no conflict of interest.

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