



Measuring Perceived Ease of Artificial Intelligence Utilisation: ... Yusuf, F. Z., Et. al. (2026)

Measuring Perceived Ease of Artificial Intelligence Utilisation: An Adaptation and Psychometric Validation of a Scale among Preservice Mathematics Teachers in Nigerian Context

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Abstract

Perceived ease of use is a foundational construct in technology-acceptance research, yet instruments developed to measure it in relation to artificial intelligence (AI) remain scarce within African teacher-education contexts. Existing scales are rarely re-examined for the specific referent of AI-assisted mathematics learning. This study adapted a six-item Perceived Ease of Use (PEOU) from the literature to an AI-in-mathematics-learning context and examined its psychometric properties among drawn 221 preservice mathematics teachers using a multistage non-probability sampling procedure from three higher institutions in the Federal Capital Territory (FCT), Abuja, Nigeria. Confirmatory factor analysis of the initial six-item one-factor model showed inadequate fit (CFI = .886, TLI = .811). However, the removal of two items with low standardised loadings produced a four-item model with an excellent fit ($\chi^2(2) = 2.770$, $p = .250$, CFI = .991, TLI = .972, RMSEA = .042, SRMR = .026). The retained scale demonstrated acceptable internal consistency ($\omega = .723$). Non-parametric comparisons revealed no statistically significant difference in PEOU AI across institutional type (Kruskal–Wallis $\chi^2(2) = 3.637$, $p = .162$) or gender (Mann–Whitney U, $z = -.567$, $p = .571$). The findings support a psychometrically sound, unidimensional four-item PEOU-AI scale for use in Nigerian mathematics teacher education and suggest that ease-of-use perceptions of AI tools are broadly comparable across the sampled institutions and gender groups.

Keywords: perceived ease of use; artificial intelligence; Technology Acceptance Model; scale adaptation; psychometric validation; preservice mathematics teachers

Introduction

Artificial intelligence (AI) has moved from a peripheral curiosity in education to an infrastructural feature of teaching and learning, reshaping how instructional content is generated, personalised, and assessed (Bernardi et al., 2025). Within teacher education specifically, the diffusion of generative and adaptive AI tools has intensified calls for programmes to prepare future teachers not merely to tolerate AI but to use it competently and confidently within their subject areas (Ayanwale et al., 2024). Mathematics teacher education occupies a particularly consequential position in this shift: AI-based tutoring systems, adaptive problem sets, and generative explanation tools are increasingly presented as solutions to persistent difficulties in mathematics teaching and learning, yet their pedagogical value depends on whether preservice teachers can and will actually use them (Bernardi et al., 2025). Whether a preservice mathematics teacher adopts such tools is shaped, in large part, by how easy the tools are perceived to be to use a psychological judgement long recognised in technology-acceptance research as a primary gateway to adoption (Davis, 1989). Perceived ease of use (PEOU) is one of two central beliefs in Davis's (1989) Technology Acceptance Model (TAM), alongside perceived usefulness, and is theorised to shape attitudes toward a technology, behavioural intention, and ultimately actual use. Studies on AI acceptance among preservice teachers continues to confirmed the salience of this construct: in a large German sample, PEOU significantly predicted



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preservice teachers' intention to use AI-based educational applications (Zhang et al., 2023), and self-efficacy-driven ease-of-use judgements have been shown to shape usefulness perceptions and adoption intentions among preservice teachers elsewhere (Ayanwale et al., 2022; Sanusi et al., 2024). Because PEOU functions as an early, formative belief in this causal chain, its accurate measurement is a precondition for any subsequent claim about what drives or blocks preservice teachers' adoption of AI in their professional preparation.

Accurate measurement, however, is not guaranteed by borrowing an established instrument wholesale. Davis's (1989) original PEOU items were written for a specific software system in a specific era of computing, and their wording cannot be assumed to transfer cleanly to a construct as contextually loaded as "AI tools for mathematics learning." Scales adapted to new technological referents routinely require empirical re-examination, because item wording that was unidimensional and reliable in one context can perform poorly once the referent changes (Zakariya, 2022). This concern is amplified in a Nigerian teacher-education setting, where preservice mathematics teachers train across structurally different institution types, conventional universities, colleges of education, and open/distance-learning universities, with differing digital infrastructure and prior AI exposure, and where instruments validated on Euro-American or East Asian samples have rarely been re-examined for structural or reliability equivalence. Despite the growing volume of AI-acceptance research involving preservice teachers in Nigeria (Ayanwale et al., 2022; Sanusi et al., 2024), the psychometric adequacy of the specific instruments used to capture PEOU in these studies is seldom the explicit object of inquiry; PEOU is typically embedded as one predictor among several in a larger structural model, and its own dimensionality, item quality, and reliability are reported in passing rather than established as a standalone contribution. This leaves a measurement gap: researchers and teacher educators in Nigeria who wish to track preservice mathematics teachers' ease-of-use perceptions of AI tools have limited independently validated evidence that a short, practically administrable PEOU-AI scale behaves as a coherent, reliable, unidimensional measure in this population.

Research Questions

To achieve this, the study is guided by the following research questions:

1. Do the items of the adapted instrument measure the dimension of perceived ease of use AI they are purported to measure?
2. What is the strength of the relationship between the items and their purported construct of perceived ease of use of AI?
3. How accurately do the items measure the construct of perceived ease of use AI they are purported to measure?
4. What is the difference in perceived ease of use of AI among preservice mathematics teachers across higher institutions in FCT, Abuja?
5. What is the difference in perceived ease of use of AI between male and female preservice mathematics teachers in FCT, Abuja?

In addressing these questions, the study contributes a psychometrically examined, contextually adapted PEOU-AI scale to the measurement toolkit available to Nigerian mathematics teacher education researchers, and provides an initial empirical account of whether the construct is perceived comparably across the more and less digitally resourced pathways into the mathematics teaching profession in Nigeria.

Theoretical Background



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The Technology Acceptance Model (Davis, 1989) remains the dominant framework for explaining why individuals accept or resist information technologies, and it anchors the present study's treatment of PEOU. TAM proposes that two beliefs, perceived usefulness and perceived ease of use, mediate the influence of external variables on attitude toward using a technology, which in turn shapes behavioural intention and actual use. PEOU is defined as the degree to which a person believes that using a particular system would be free of effort (Davis, 1989); it is a judgement about the cognitive and physical cost of operating a technology, distinct from perceived usefulness, which concerns whether the technology helps the user accomplish a goal. Davis's original instrument operationalised PEOU with six items assessing whether a target system was easy to learn, easy to control, clear and understandable, flexible, easy to become skilful with, and easy to use overall, items that this study adapts, retaining their underlying content while substituting the named referent (a spreadsheet system, "CHART-MASTER") with the referent of interest here, AI tools for mathematics learning. TAM assigns PEOU a dual theoretical role: a direct effect on attitude and intention, and an indirect effect through perceived usefulness, since a technology requiring less effort is, all else equal, judged more useful (Davis, 1989). Contemporary AI-acceptance studies involving preservice teachers substantiate both pathways: in a multigroup structural analysis of German preservice teachers, PEOU exerted a significant direct effect on intention to use AI-based applications alongside perceived usefulness (Zhang et al., 2023), and comparable patterns have emerged among preservice teachers in Nigeria (Ayanwale et al., 2022; Sanusi et al., 2024). These findings justify treating PEOU as a construct worth measuring in its own right rather than as an incidental item set nested within a larger acceptance model. It is important to be explicit about scope: the present study is a measurement and validation study, not a structural test of the full TAM nomological network. It does not model PEOU's relationship with perceived usefulness, attitude, or behavioural intention; rather, it establishes whether a set of items adapted from Davis's (1989) PEOU subscale forms a coherent, reliable, unidimensional measure of ease-of-use beliefs about AI tools among Nigerian preservice mathematics teachers, a necessary precursor to any subsequent structural application of TAM in this specific population and technological referent.

Review of Related Literature

Ease-of-use judgements have proven to be one of the more consistently influential constructs in the growing literature on preservice teachers' AI acceptance, even as the specific pattern of effects varies by context. Zhang et al. (2023), studying 452 preservice teachers in Germany using an extended TAM with measurement invariance and multigroup analysis, found that both PEOU and perceived usefulness significantly predicted intention to use AI-based educational applications, and that the pathway from AI anxiety to PEOU was itself moderated by gender. Other TAM extensions incorporating self-efficacy and trust constructs have found AI self-efficacy to be among the strongest predictors of PEOU, which in turn feeds forward into usefulness judgements (Ayanwale et al., 2024). This body of work converges on two conclusions relevant to the present study: PEOU is empirically distinguishable from, yet closely entangled with, perceived usefulness; and its magnitude is sensitive to population, referent, and cultural context, which is precisely why re-validation is warranted whenever the referent changes. Within Nigeria specifically, AI-acceptance research involving preservice teachers has grown rapidly but has concentrated on broader readiness, literacy, and behavioural-intention outcomes rather than on the standalone measurement properties of constructs such as PEOU. Ayanwale et al. (2022), examining teachers' readiness and intention to teach AI in schools, established that perceived relevance and confidence-related beliefs strongly predict readiness. Sanusi et al. (2024) surveyed preservice teachers across North Central Nigerian universities using a theory-of-planned-behaviour framework extended with AI-specific constructs,



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and reported that basic AI knowledge and subjective norms were the strongest predictors of intention to learn AI; ease-of-use-type judgements, embedded within related self-efficacy items, again functioned as one input among many rather than as a scale subjected to independent psychometric scrutiny. Ayanwale et al. (2024) examined AI literacy, rather than TAM-based acceptance, among Nigerian preservice teachers using structural equation modelling, further illustrating the country's growing research appetite without addressing the measurement adequacy of an AI-specific PEOU scale. Recent multi-country TAM work situated PEOU centrally in explaining university students' AI adoption in African higher education, reinforcing its relevance while highlighting how rarely the scale itself, rather than the structural model built upon it, is the object of independent psychometric inquiry (Mbona & Msosa, 2026).

Mathematics teacher education, though not the exclusive focus of the studies above, is an especially relevant site for this inquiry: AI tools marketed for mathematics learning, such as adaptive tutoring systems and generative explanation tools, place distinct cognitive demands on users compared with general-purpose AI applications, and preservice mathematics teachers' engagement with such tools shapes how mathematics is likely to be taught in AI-augmented classrooms. Bernardi et al., (2025) found that preservice teachers' interactions with generative AI in mathematics education were shaped as much by their confidence in evaluating AI-generated mathematical content as by generic usability judgements, suggesting that a PEOU measure based specifically in mathematics-learning use captures something conceptually distinct and pedagogically important. On the measurement side, adapting existing scales to new technological referents without re-establishing their factorial structure and reliability has been repeatedly criticised in the psychometric literature. Zakariya (2022), writing specifically about mathematics education research, cautions that a high internal-consistency coefficient does not by itself demonstrate that an instrument is unidimensional, and recommends pairing reliability estimation with confirmatory factor analysis and, where essential tau-equivalence is untenable, using model-based coefficients such as McDonald's omega rather than Cronbach's alpha alone. Dunn et al. (2014) make a parallel argument, showing that omega is less biased than alpha when items vary in their factor loadings, a condition common, and often undetected, in adapted scales whose items were not originally designed as parallel measures. These recommendations directly inform the analytic approach adopted here, in which the factorial structure of the adapted PEOU-AI items is established through CFA before reliability was estimated using omega, rather than assuming the original instrument's properties transfer unchanged to the new referent and population. Read together, the literature establishes three things clearly: PEOU is a theoretically and empirically important construct in AI-acceptance research involving preservice teachers; Nigerian research in this space has grown substantially but has not isolated PEOU-AI as a measurement target in mathematics teacher education specifically; and current psychometric guidance cautions strongly against assuming that an adapted scale retains its original structure and reliability without direct empirical verification. These three observations jointly motivate the present study.

Statement of the Research Problem

Taken together, the reviewed literature suggested the presence of a clearly identifiable and addressable research gap which, to the best of our knowledge at the time of writing, warrants further empirical investigation. While Nigerian AI-acceptance research involving preservice teachers has expanded considerably, it has treated perceived ease of use largely as an embedded predictor within larger structural models, rather than as a construct whose own measurement property,



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dimensionality, item quality, and reliability, in an AI-in-mathematics-learning referent, are independently established. No identified study has adapted Davis's (1989) PEOU subscale specifically to this referent and subjected the adapted items to confirmatory factor analysis and model-based reliability estimation among Nigerian preservice mathematics teachers drawn from structurally different institution types. This leaves teacher educators without a psychometrically examined short-form instrument for tracking ease-of-use perceptions of AI, and without evidence on whether such perceptions are comparable across institutional pathways and gender, both relevant to designing equitable, targeted AI-integration support.

Research Methodology

Research Design

This study adopted a cross-sectional, quantitative survey design because this approach is appropriate for scale adaptation and psychometric validation research. A cross-sectional design collects data at a single time point, allowing efficient evaluation of an adapted instrument's measurement properties without repeated observations (Zakariya, 2022; Castillo-Díaz & Periañez, 2026). This design also enables collection of standardized numerical data suitable for statistical procedures such as exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and reliability testing, which are necessary to establish factorial structure, internal consistency, and validity. Since the primary objective is to assess the adapted scale's suitability rather than to examine changes over time, one-time data collection is methodologically sufficient (Zakariya, 2022; Carcausto Huamani et al., 2026).

Sampling Technique

A multistage non-probability sampling procedure was used. First, purposive sampling was employed to select three public tertiary institutions in the Federal Capital Territory, Abuja, representing the three institutional types. These institutions were selected because they offer accredited Mathematics Education programmes and represent different institutional types for preparing preservice mathematics teachers. Their inclusion ensured that participants possessed the relevant academic background to provide informed responses on the study variables (Ahmed, 2024; Magnone & Yeziarski, 2024). Second, convenience sampling was used to recruit preservice mathematics teachers who were available and willing to participate during data collection. This approach was appropriate because participant access depended on student availability and institutional constraints. Although practical, convenience sampling may introduce selection bias, as participants may differ from non-participants (Ahmed, 2024). The sampling approach was guided by participant eligibility, institutional accessibility, participant availability, and the practical feasibility of data collection. The final sample comprised 221 preservice mathematics teachers across the three institutional types (77 [34.8%] from the open-distance type, 73 [33.0%] from the college of education type, and 71 [32.1%] from the conventional university type). The sample included 112 females (50.7%) and 109 males (49.3%), providing near-balanced gender representation and participation across the three teacher-education pathways. Including participants from different institutional types was relevant because studies have reported variations in AI awareness, utilisation, and adoption in mathematics and STEM education as Olarewaju et al., (2025) identified a gap between AI awareness and utilisation among preservice mathematics teachers, while Awofala et al. (2025) found that perceived usefulness, ease of use, and trust significantly influenced AI adoption among STEM teachers. Accordingly, the selected sample provided an appropriate context for examining preservice mathematics teachers' perceptions (Awofala et al., 2025; Olarewaju et al., 2025).

Ethical Considerations



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The study adhered to established ethical principles for research involving human participants. Institutional permission was obtained before data collection, and participants were informed of the study's purpose, procedures, voluntary nature, and their right to withdraw without penalty. Informed consent was obtained from all participants before participation. Participants' rights, dignity, welfare, and autonomy were protected throughout the study (World Medical Association [WMA], 2024). Participation was voluntary, with no coercion or inducement. No personally identifying information was collected, and responses were used solely for academic purposes and reported in aggregate form. Data were securely stored and accessible only to the researcher to ensure privacy and confidentiality. The study posed minimal risk because it concerned participants' educational experiences, perceptions of AI. The principles of beneficence, nonmaleficence, justice, respect for persons, and confidentiality were maintained throughout the research process (WMA, 2024; Blue Blocks Micro Research Institute, 2026).

Instrument

The Perceived Ease of Use of AI (PEOU-AI) was measured using a six-item questionnaire adapted from the perceived-ease-of-use subscale of the Technology Acceptance Model developed by Davis et al. (1989). The adaptation retained the original structure of the six items while replacing the technology-specific reference with "AI tools for mathematics learning" to suit the context of this study. Table 1 presents a comparison between the original PEOU items and the adapted PEOU-AI scale.

Table 1

Comparison of Original PEOU Items (Davis, 1989) and Adapted PEOU-AI Items

No.	PEOU (Davis, 1989)	Adapted PEOU-AI
1	Learning to operate CHART-MASTER would be easy for me.	Learning to use AI tools for mathematics learning is easy for me.
2	I would find it easy to get CHART-MASTER to do what I want it to do.	I find it easy to get AI tools to do the tasks I want in mathematics.
3	My interaction with CHART-MASTER would be clear and understandable.	My interaction with AI tools for learning mathematics is clear and understandable.
4	I would find CHART-MASTER to be flexible to interact with.	I find AI tools to be flexible to interact with while learning mathematics.
5	It would be easy for me to become skilful at using CHART-MASTER.	It is easy for me to become skilful at using AI tools for learning mathematics.
6	I would find CHART-MASTER easy to use.	I find AI tools easy to use for mathematics learning.

Table 1 presents the primary instrument used for data collection was the Perceived Ease of Use of Artificial Intelligence (PEOU-AI) questionnaire, a six-item structured scale adapted from the Perceived Ease of Use (PEOU) subscale of the Technology Acceptance Model (TAM) developed by Davis et al. (1989). The original PEOU subscale formed part of a 12-item, two-dimensional instrument designed to measure perceived usefulness and perceived ease of use of a technology. For this study, the six original PEOU items were modified by replacing the system-specific reference ("CHART-MASTER") with AI tools for mathematics learning, while retaining the original item structure and meaning. Table 1 presents a comparison between the original PEOU items and the adapted PEOU-AI items. The PEOU-AI questionnaire consisted of two sections. The first section collected demographic information, including respondents' gender and institutional type. The second section comprised six items measuring students' perceived ease of use of AI tools for mathematics learning. Responses were recorded on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

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Validity and Reliability Procedures

The construct validity of the Perceived Ease of Use of Artificial Intelligence (PEOU-AI) scale was assessed using confirmatory factor analysis (CFA). An initial one-factor model comprising six items was specified, with all items loading on a single latent PEOU-AI construct. Model fit was evaluated using the chi-square statistic (χ^2), relative chi-square ratio (χ^2/df), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). Model adequacy was assessed using the criteria proposed by Hu and Bentler (1999): $\chi^2/df < 3.0$, $RMSEA \leq .08$, CFI and TLI $\geq .90$, and $SRMR \leq .08$. Where the hypothesised model failed to achieve acceptable fit, standardized factor loadings and modification indices were examined to identify sources of model misfit. Items with factor loadings below the recommended threshold of .50 were considered for removal, provided that such decisions were theoretically justified and did not compromise the conceptual integrity of the construct. The measurement model was subsequently re-estimated using the retained items. The internal consistency reliability of the final PEOU-AI scale was assessed using McDonald's coefficient omega (ω). Omega was preferred to Cronbach's alpha because it does not require the assumption of essential tau-equivalence and provides a more accurate estimate of reliability when items contribute unequally to the latent construct (Dunn et al., 2014; Zakariya, 2022).

Presentation of Results

Addressing Research Questions One and Two

In order to establish the construct validity of PEOU-AI scale, CFA of the 6-item one-factor PEOU-AI was conducted. The CFA results for the PEOU-AI demonstrated an excellent model fit of the generated data. The global fit statistics of this model are presented in Table 1.

Table 2

The goodness of fit statistics for one-factor PEOU scale

Global fit statistics	Model 1	Model 2
Chi-square		
Estimate (χ^2)	24.291	2.770
Degrees of freedom (df)	9	2
p-value	.0039	.2503
χ^2 / df	2.699	1.385
RMSEA (Root Mean Square Error of Approximation)		
Estimate	.088	.042
90 percent confidence interval	[.047, .131]	[<.001, .147]
Probability RMSEA $\leq$.05	.064	.425
CFI/TLI		
CFI (Comparative Fit Index)	.886	.991
TLI (Tucker-Lewis index)	.811	.972
SRMR (Standardized Root Mean Square Residual)	.064	.026

Model 2 is an improvement on Model 1 by deleting items PEU05 and PEU06.

The presented results in Table 1 show that the initial one-factor model of the Perceived Ease of Use (PEOU) of AI scale (Model 1) did not demonstrate an adequate fit to the data based on the criteria by Hu and Bentler (1999). Although the SRMR (.064) was within the acceptable threshold, the model exhibited a significant chi-square, $\chi^2(9) = 24.291$, $p = .004$ with an acceptable relative chi-square ($\chi^2/df = 2.699$) and RMSEA of .088 but a CFI (.886) and TLI (.811) values below the recommended cutoff of .90, indicating poor overall fit. A careful examination of the factor loadings coupled with

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some guide from the modification indices, revealed that item 5 (.389) and item 6 (.354) have low standardised factor loadings. Thus, these two items were deleted from the model yielding Model 2 with a substantial improvement in fit. As presented in Table 1, the Model 2 demonstrates an excellent model fit of the dataset with a non-significant chi-square, $\chi^2(2) = 2.770$, $p = .2503$ with $\chi^2/df = 1.385$ (less than 3), RMSEA = .042, CFI = .991, TLI = .972, and SRMR = .026. All fit indices satisfied the Hu and Bentler (1999) criteria for an excellent global fit model, indicating that the revised one-factor four-factor model provides an excellent representation of the observed data and supports the unidimensional structure of the Perceived Usefulness of AI scale.

Addressing Research Question Three

The structural model of this instrument and some local fit statistics are presented in Figure 1. The figure displays the standardised factor loadings of the four retained PEOU-AI items on a single latent factor (PEU), with error variances shown for each observed indicator.

Figure 1

Standardised estimates of model parameters for the 1-factor PEOU scale

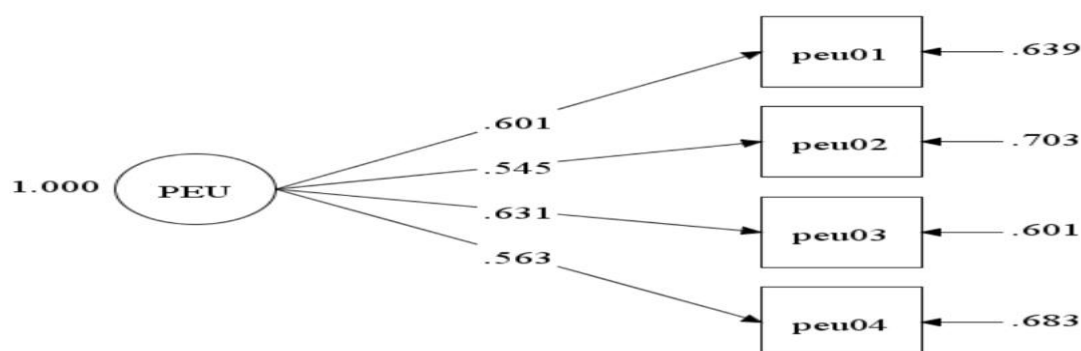


Figure 1 presents the standardised parameter estimates for the one-factor PEOU-AI model comprising four observed items (peu01–peu04). All four items loaded positively and significantly on the latent construct, with standardised factor loadings of .601 (peu01), .545 (peu02), .631 (peu03), and .563 (peu04), all exceeding the .50 threshold recommended for retaining items in a reflective measurement model. The corresponding error variances ranged from .601 to .703, indicating that the latent factor accounted for approximately 30% to 40% of the variance in each item. The uniformly moderate loadings suggest that the four items form a coherent but not redundant unidimensional scale, providing acceptable evidence of convergent validity for the PEOU-AI instrument.

Addressing Research Question Four

The distribution of perceived ease of use of AI (PEOU-AI) scores across institutional types was examined prior to hypothesis testing. Figure 2 presents the mean PEOU-AI scores with error bars, while Tables 3 and 4 report the assumptions and results of the comparative analysis across the three institutions.

Figure 2:

Mean perceived ease of use of AI by school type (error bars: ± 1 SD)

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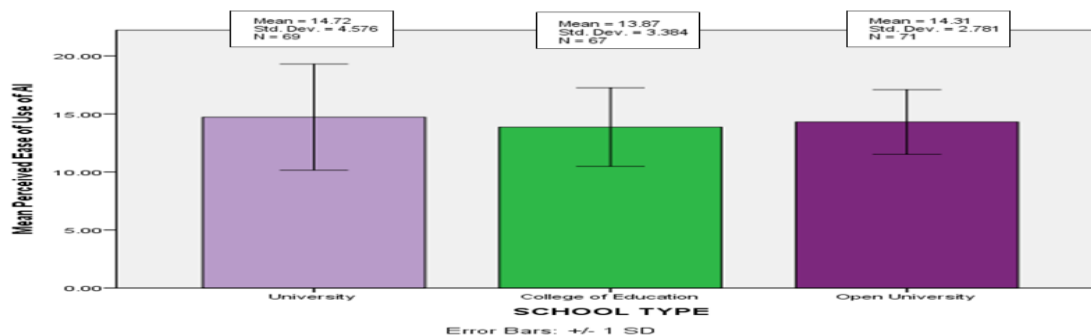


Figure 2 showed that mean PEOU-AI scores were highest among university students ($M = 14.72$, $SD = 4.576$, $n = 69$), followed by open university students ($M = 14.31$, $SD = 2.781$, $n = 71$) and college of education students ($M = 13.87$, $SD = 3.384$, $n = 67$).

Table 3

Tests of Normality of PEOU-AI Scale across institutional type

	School Type	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	p-value	Statistic	Df	p-value
Perceive Ease of Use of AI	University	.132	69	.005	.913	69	.000
	College of Education	.184	67	.000	.952	67	.011
	Open University	.132	71	.004	.955	71	.013

a. Lilliefors Significance Correction

The normality tests in Table 3 indicated that PEOU-AI scores deviated significantly from normality in all three institutions (Kolmogorov-Smirnov $p < .05$; Shapiro-Wilk $p < .05$), violating the assumption required for parametric testing. Consequently, the non-parametric Kruskal-Wallis test was employed. As shown in Table 4,

Table 4

Kruskal-Wallis test of mean difference in PEOU across institutions

School Type	N	Mean Rank	Chi-Square	df	p-value
University	69	114.65	3.637	2	.162
College of Education	67	95.67			
Open University	71	101.51			

Table 4, revealed that the test had no statistically significant difference in PEOU-AI scores across the three institutional types, $\chi^2(2) = 3.637$, $p = .162$. The mean ranks were 114.65 for university students, 95.67 for college of education students, and 101.51 for open university students. These findings indicated that preservice mathematics teachers' perceived ease of use of AI did not differ significantly by institutional affiliation.

Addressing Research Question Five

The distribution of perceived ease of use of AI (PEOU-AI) scores across gender was examined prior to hypothesis testing. Figure 3 presents the mean PEOU-AI scores with error bars, while Tables 4 and 5 report the assumptions and results of the comparative analysis between male and female participants

Figure 3

Mean perceived ease of use of AI by gender (error bars: ± 1 SD)

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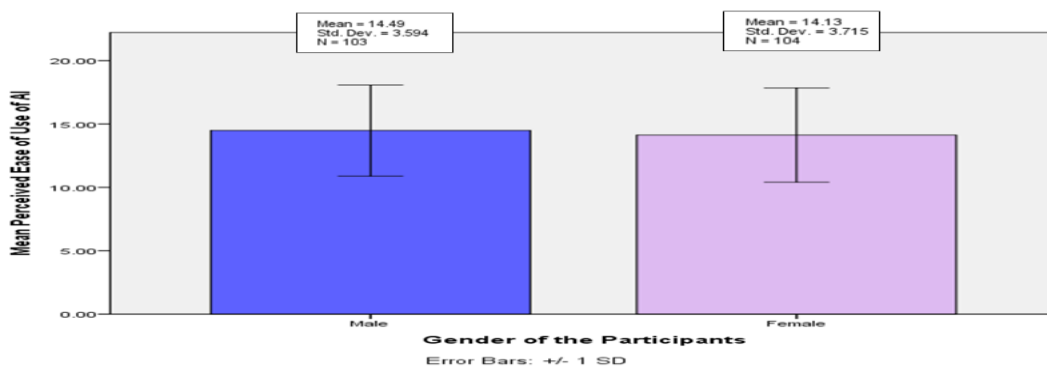


Figure 3 showed that male participants reported slightly higher mean PEOU-AI scores ($M = 14.49$, $SD = 3.594$, $n = 103$) than female participants ($M = 14.13$, $SD = 3.715$, $n = 104$).

Table 5

Tests of Normality of PEOU-AI Scale across institutional type

Gender of the Participants		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	p-value	Statistic	df	p-value
Perceived Ease of Use of AI	Male	.106	103	.006	.965	103	.008
	Female	.151	104	<.001	.944	104	<.001

a. Lilliefors Significance Correction

The normality tests in Table 5 indicated that PEOU-AI scores deviated significantly from normality for both male (Kolmogorov-Smirnov $p = .006$; Shapiro-Wilk $p = .008$) and female (Kolmogorov-Smirnov $p < .001$; Shapiro-Wilk $p < .001$) participants, violating the assumption required for parametric testing. Consequently, the non-parametric Mann-Whitney U test was employed. As shown in Table 6,

Table 6

Mann-Whitney test of mean difference in PEOU across gender

School Type	N	Mean Rank	Sum of Rank	U - value	z-value	p-value
Male	103	106.36	10955.00	5113.00	-.567	.571
Female	104	101.66	10573.00			

Table 6, revealed that the test had no statistically significant difference in PEOU-AI scores between male and female participants, $U = 35113.00$, $z = -.567$, $p = .571$. The mean ranks were 114.65 for males and 101.51 for females. These findings indicated that preservice mathematics teachers' perceived ease of use of AI did not differ significantly by gender.

Discussion of Findings

The findings provide evidence that the adapted Perceived Ease of Use of Artificial Intelligence (PEOU-AI) scale is a valid measure for assessing preservice mathematics teachers' perceptions of AI ease of use. The initial six-item one-factor model did not meet all recommended model-fit criteria, with the Comparative Fit Index ($CFI = .886$) and Tucker-Lewis Index ($TLI = .811$) falling below the recommended .90 threshold (Hu & Bentler, 1999). Examination of the factor loadings showed that two items, "becoming skillful at using AI" and "AI is easy to use", loaded weakly on the construct, indicating that they did not adequately measure perceived ease of use in this context. After these items were removed, the four-item model achieved excellent fit and satisfied all recommended criteria. The results therefore answered the first three research questions. First, the retained four items measured a single underlying construct, confirming the unidimensional nature of the PEOU-



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AI scale. Second, the retained items demonstrated strong relationships with the construct, indicating that they were appropriate indicators of perceived ease of use. Third, the final model showed excellent fit, suggesting that it accurately represented the observed data. These findings support the view that measurement instruments adapted from existing theories should be empirically validated before use in new contexts, rather than assuming that the original scale will function equally well with a different technology or population (Zakariya, 2022; Bernardi et al., 2025).

The scale also demonstrated acceptable internal consistency reliability ($\omega = .723$). This value indicated that the four items consistently measured the same construct and are suitable for research purposes. Although the reliability estimate meets accepted standards, it also suggests room for improvement through the development of additional AI-specific items that may strengthen the scale in future studies (Dunn et al., 2014; Zakariya, 2022). The findings further revealed no significant differences in perceived ease of use of AI across institution types. Preservice mathematics teachers from universities, colleges of education, and the open university reported similar levels of perceived ease of use. This suggests that AI ease-of-use beliefs are relatively consistent across the different teacher education pathways represented in the study. One possible explanation is the increasing accessibility of AI tools through mobile technologies and digital platforms, which may provide students with similar opportunities for exposure regardless of institutional context (Ayanwale et al., 2024). Similarly, no significant gender differences were found in perceived ease of use of AI. Male and female preservice mathematics teachers reported comparable perceptions regarding the ease of using AI tools. This finding aligns with previous studies that have shown limited or no gender differences in core technology acceptance beliefs, particularly perceived ease of use (Zhang et al., 2023). The result suggested that gender may not be a major factor influencing initial perceptions of AI usability among preservice mathematics teachers. Finally, the study demonstrated that the four-item PEOU-AI scale is a valid and reliable instrument for measuring perceived ease of use of AI among preservice mathematics teachers. The absence of significant differences across institution types and gender further suggests that perceptions of AI ease of use are broadly shared within the study population. These findings provide encouraging evidence that AI-related learning technologies may be accepted similarly across different preservice teacher groups within the FCT, Abuja.

Implications of the study

The validated four-item Perceived Ease of Use of Artificial Intelligence (PEOU-AI) scale provides mathematics teacher educators with a short and reliable instrument for assessing preservice teachers' perceptions of the ease of using AI tools in mathematics education. Because the scale demonstrated good model fit, unidimensionality, and acceptable reliability, it can be used with greater confidence than unvalidated adaptations of existing Technology Acceptance Model (TAM) measures. For teacher education institutions and policymakers, the absence of significant differences across institution types and gender suggested that AI-related training and support programmes can initially be designed for all preservice mathematics teachers rather than targeted at specific groups. Efforts should therefore focus on increasing exposure to and competence in the use of AI tools for mathematics teaching and learning. For researchers, the findings highlight the importance of validating adapted measurement instruments before use. Even widely accepted scales should be subjected to confirmatory factor analysis and reliability testing when applied to new contexts or populations. However, these implications are limited to the population studied and should not be generalized beyond preservice mathematics teachers in the FCT, Abuja, without further validation.



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Limitations of the Study

Some limitations should be considered when interpreting the findings. The study employed a cross-sectional design, which captured participants' perceptions at only one point in time and could not examine changes in perceptions with increased exposure to AI tools. The data were self-reported, making the results susceptible to social desirability bias and common-method bias. Finally, the participants were drawn from only three higher institutions in the FCT, Abuja. Therefore, the findings should not be generalized to preservice teachers in other regions of Nigeria or to in-service teachers without additional validation studies.

Conclusion

This study adapted and validated a Perceived Ease of Use of Artificial Intelligence (PEOU-AI) scale among preservice mathematics teachers from three higher institutions in the FCT, Abuja. Following the removal of two poorly performing items, a four-item, one-factor scale demonstrated excellent model fit and acceptable internal consistency, supporting its suitability for measuring perceptions of AI ease of use in mathematics education. The findings further showed that perceptions of AI ease of use did not differ significantly across institution types or gender groups. The study therefore provides a brief and psychometrically supported instrument that can be used in future research on AI adoption among preservice mathematics teachers.

Recommendations for Future Research

1. Future studies should validate the four-item PEOU-AI scale using larger and more geographically diverse samples of preservice mathematics teachers across Nigeria to determine whether the factor structure and model fit remain stable.
2. Researchers should also examine the scale within a complete Technology Acceptance Model framework by investigating its relationships with perceived usefulness, attitude toward AI, and behavioural intention to use AI.
3. measurement invariance should be tested across gender and institution types before making strong group comparisons.
4. Longitudinal studies are recommended to examine how perceptions of AI ease of use change as preservice teachers gain more experience and training in the use of AI tools for mathematics instruction.

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