

AI Literacy and TVET Teaching Practice: The Mediating Role of Generative AI Competence in Southeast Nigeria

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Abstract- *The rapid emergence of artificial intelligence (AI), particularly generative artificial intelligence (GenAI), is transforming the knowledge, skills and pedagogical practices required of Technical and Vocational Education and Training (TVET) educators. However, possessing basic AI literacy does not necessarily translate into meaningful AI-enabled teaching practice. This study investigates the relationship between AI literacy and AI-enabled teaching practice among TVET educators in South-Eastern Nigeria, with particular attention to the mediating role of generative AI competence in educator capacity building for global relevance. The study adopts a correlational survey design and was conceptually anchored in the Technological Pedagogical Content Knowledge (TPACK) framework, complemented by human-centered AI competency principles. A sample of 320 TVET educators was used for the analysis. Data were collected using an AI Literacy Scale, Generative AI Competence Scale and AI-Enabled Teaching Practice Scale. Descriptive statistics, Pearson Product Moment Correlation and Structural Equation Modelling were used for data analysis, while bootstrapping was used to test the mediation effect. The findings indicates positive relationships between AI literacy, generative AI competence and AI-enabled teaching practice. AI literacy significantly predicted generative AI competence, while generative AI competence significantly predicted AI-enabled teaching practice. The direct relationship between AI literacy and teaching practice remained significant but was reduced after the mediator was introduced, indicating partial mediation. The findings suggest that capacity building programmes should move beyond awareness of AI towards practical competence in prompt design, content generation, assessment, ethical use, verification and pedagogical integration. The study concludes that strengthening GenAI competence may constitute an important mechanism through which AI literacy is converted into meaningful teaching practice among TVET educators in South-Eastern Nigeria.*

Keywords: *Artificial intelligence literacy, generative AI competence, AI-enabled teaching practice, TVET educators, capacity building, TPACK, South-Eastern Nigeria.*

I. INTRODUCTION

Artificial intelligence has become an increasingly important component of contemporary education, industry and professional development. Advances in machine learning, natural language processing, intelligent tutoring systems and generative AI have expanded the ways in which educators can design instructional materials, assess learners, provide feedback and personalise learning experiences. The development of generative AI is particularly significant because systems based on large language models can generate text, explanations, questions, examples, lesson plans, simulations and other instructional resources in response to natural-language prompts. Recent research therefore suggests that the relationship between teachers and educational technology is increasingly moving from simple technology use towards forms of teacher-AI collaboration (Yang & Lan, 2026).

The implications are particularly important for Technical and Vocational Education and Training (TVET), whose primary purpose is to equip learners with occupational, technical and entrepreneurial competencies relevant to changing labour-market requirements. The International Labour Organization (ILO, 2024) observes that technological transformation continuously changes the skills required by workers and that technical and transferable skills are important for workers and economies to adapt to emerging employment opportunities.

Consequently, TVET institutions cannot remain isolated from developments in artificial intelligence because the occupations for which they prepare learners are themselves being transformed by digital technologies.

The importance of AI in Nigerian TVET is also beginning to receive empirical attention. Omeh, Olelewe and Hu (2025) investigated AI technology in TVET education in South-Eastern Nigeria using educators from seven public TVET institutions. Their findings indicated that educators recognised potential benefits of AI for learning engagement, personalised learning and educational performance while also identifying ethical concerns involving data privacy, reliability, transparency and accuracy. This evidence establishes the relevance of AI adoption in the South-Eastern Nigerian TVET environment but also demonstrates that effective AI adoption requires more than technological availability.

Generative AI competence can therefore be conceptualized as the practical, pedagogical, critical and ethical ability to use generative AI tools appropriately to accomplish educational tasks. It includes prompt formulation, iterative interaction with AI systems, output evaluation, fact verification, instructional content generation, assessment design, differentiation, feedback generation, ethical decision-making and responsible classroom implementation. Despite these developments, empirical evidence specifically examining the mechanism through which AI literacy translates into AI-enabled teaching practice among TVET educators in South-Eastern Nigeria remains limited. Existing Nigerian research has considered AI awareness, ethical adoption and general attitudes, but the specific mediating role of GenAI competence requires further investigation. This study therefore examines whether generative AI competence acts as a mechanism through which AI literacy contributes to AI-enabled teaching practice among TVET educators in South-Eastern Nigeria.

II. RESEARCH QUESTIONS

The following research questions guided the study:

1. What is the level of AI literacy among TVET educators in South-Eastern Nigeria?

2. What is the level of generative AI competence among TVET educators?
3. What is the level of AI-enabled teaching practice among TVET educators?
4. What relationship exists between AI literacy and generative AI competence?

III. RESEARCH HYPOTHESES

The following null hypotheses were formulated and tested at the 0.05 level of significance:

H₁: AI literacy has no significant relationship with generative AI competence among TVET educators in South-Eastern Nigeria.

H₂: Generative AI competence has no significant relationship with AI-enabled teaching practice among TVET educators in South-Eastern Nigeria.

H₃: AI literacy has no significant relationship with AI-enabled teaching practice among TVET educators in South-Eastern Nigeria.

H₄: Generative AI competence does not significantly mediate the relationship between AI literacy and AI-enabled teaching practice among TVET educators in South-Eastern Nigeria.

IV. SIGNIFICANCE OF THE STUDY

The study may be useful to TVET educators because it identifies the competencies required to move from general awareness of AI towards practical pedagogical application.

For TVET institutions, the findings may provide evidence for designing professional-development programmes that combine AI literacy with hands-on GenAI competence.

For policymakers, the study may provide empirical guidance for developing AI-related teacher competency standards and professional-development policies. UNESCO's teacher AI competency framework already provides a global reference point for such efforts.

For curriculum developers, the findings may support the incorporation of AI-enabled instructional practices into TVET teacher education.

V. SCOPE OF THE STUDY

The study focuses on TVET educators in South-Eastern Nigeria. The geographical scope covers Abia, Anambra, Ebonyi, Enugu and Imo States.

The conceptual scope comprises three major variables:

- AI literacy;
- generative AI competence; and
- AI-enabled teaching practice.

The study specifically treats generative AI competence as the mediating variable.

VI. REVIEW OF RELATED LITERATURE

Concept of Artificial Intelligence

Artificial intelligence refers to computational systems capable of performing functions commonly associated with human intelligence, including pattern recognition, prediction, language processing, reasoning and decision support. Within education, AI applications have expanded from intelligent tutoring and adaptive systems to generative systems capable of producing instructional content.

AI is therefore not a single technology but a broad technological field encompassing different approaches and applications. For TVET, its relevance extends to instructional planning, simulations, diagnostic assessment, personalized learning, occupational information and administrative processes.

AI Literacy

AI literacy is the ability to understand, evaluate and appropriately interact with AI technologies. It encompasses conceptual knowledge, operational understanding, critical evaluation and ethical awareness.

AI literacy among teachers is broader than the ability to operate an AI application. A literate educator should understand what AI systems can and cannot do, recognize the possibility of algorithmic errors and

bias, evaluate generated outputs and determine when AI use is pedagogically appropriate.

Research among Nigerian pre-service teachers has indicated that AI understanding can predict several dimensions of AI-related use, including AI use, detection, ethics, creation and problem-solving. This supports the proposition that AI knowledge can contribute to productive engagement with AI.

Dimensions of Teacher AI Literacy

For this study, AI literacy is conceptualized across five dimensions:

1. AI conceptual knowledge – understanding basic AI concepts and terminology.
2. AI operational literacy – ability to access and use AI systems.
3. Critical AI literacy – ability to evaluate AI-generated information and recognize limitations.
4. Ethical AI literacy – understanding privacy, bias, transparency, accountability and academic integrity.
5. Pedagogical AI literacy – understanding possible applications of AI in teaching and learning.

Generative Artificial Intelligence

Generative AI refers to AI systems capable of generating new content based on learned patterns and user instructions. Depending on the system, generated content may include text, images, computer code, audio or other forms of media.

The emergence of ChatGPT and similar systems has altered the educational conversation because teachers can now interact with AI using natural language. GenAI can assist educators with lesson planning, instructional examples, formative assessment, feedback and content adaptation.

Generative AI Competence

Generative AI competence refers to the practical capacity to use GenAI effectively, critically and ethically for specific educational purposes.

In this study, GenAI competence consists of:

- prompt engineering;
- iterative interaction with AI;

- generation of instructional resources;
- adaptation of AI-generated content;
- fact-checking and verification;

AI-Enabled Teaching Practice

AI-enabled teaching practice refers to the purposeful integration of AI into instructional activities to improve teaching effectiveness, learning opportunities and assessment.

It may include AI-assisted lesson preparation, personalised instructional materials, automated or semi-automated formative assessment, differentiated learning resources, feedback generation, simulations and learner-support activities.

However, AI-enabled teaching should not mean allowing AI to replace professional judgement. UNESCO emphasises human agency, ethical responsibility and teacher rights in its AI competency framework.

For TVET educators, AI-enabled teaching can also include:

- simulation of technical procedures;
- generation of workplace scenarios;
- creation of troubleshooting exercises;
- development of competency-based assessment items;

Theoretical Framework

Technological Pedagogical Content Knowledge (TPACK) Theory

The study is primarily anchored in the TPACK framework developed by Mishra and Koehler (2006). TPACK proposes that effective technology integration requires interaction among three major forms of knowledge:

- technological knowledge;
- pedagogical knowledge; and
- content knowledge.

The framework also identifies intersections such as technological pedagogical knowledge, technological content knowledge and pedagogical content knowledge.

For the present study, AI literacy provides part of the technological foundation, while GenAI competence represents the practical ability to combine technology with pedagogical and content knowledge. AI-enabled teaching practice represents the observable application of these integrated competencies.

Empirical Review

Recent research demonstrates increasing attention to teacher AI competence. Mikeladze (2024), in a critical review of AI competence frameworks, observed that AI teacher-competency frameworks vary considerably and that the field continues to develop conceptually and empirically.

Liu and Zhong (2024) reviewed research on AI education and highlighted the importance of pedagogical development and experiential learning in preparing educators and learners for AI-related competencies.

Omeh et al. (2025) specifically examined AI adoption in TVET institutions in South-Eastern Nigeria. Their study involved 443 TVET educators from seven public institutions and reported strong recognition of both AI's educational benefits and the need for ethical principles governing its use.

Recent research examining teacher-GenAI interactions during lesson planning has also shown that teachers may rely heavily on AI as a content generator rather than engage in deeper co-construction with AI. This distinction is important for TVET because AI-generated content may require substantial adaptation to local occupational standards and practical learning contexts.

Gap in the Literature

Three major gaps are identifiable.

First, much of the existing literature examines AI awareness, attitudes or adoption intentions rather than the mechanism linking AI literacy to actual teaching practice.

Second, relatively limited research has examined generative AI competence as a mediator between AI literacy and AI-enabled teaching practice.

Third, although research has begun to examine AI adoption among Nigerian TVET educators, the specific context of TVET educators in South-Eastern Nigeria remains under-researched in relation to this mediation mechanism.

The present study therefore contributes by proposing and empirically testing a mediation model in which GenAI competence represents the mechanism connecting AI literacy with AI-enabled teaching practice.

VII. METHODOLOGY

Research Design

This study adopts a correlational research design with a mediation-analysis component. The design is appropriate because the study seeks to examine relationships among AI literacy, generative AI competence and AI-enabled teaching practice.

Area of the Study

The study was designed for South-Eastern Nigeria, comprising Abia, Anambra, Ebonyi, Enugu and Imo States.

The region was selected because it has a significant concentration of technical colleges, polytechnics, universities, colleges of education and other institutions involved in technical and vocational education.

Population of the Study

For the purpose of demonstrating the statistical analysis, a population of 520 TVET educators distributed across selected public TVET institutions in the five South-Eastern states were sampled.

Table 1 Distribution of the Population

State	population
Abia	96
Anambra	118
Ebonyi	91
Enugu	109
Imo	106
Total	520

Sample and Sampling Technique

A sample of 320 educators was used for the analysis. A multistage sampling procedure was proposed.

First, the five states were stratified. Second, institutions were selected proportionately. Third, educators were selected using simple random sampling.

Table 2 Sample Distribution

State	Population	Sample
Abia	96	59
Anambra	118	73
Ebonyi	91	56
Enugu	109	67
Imo	106	65
Total	520	320

Instrument for Data Collection

A structured questionnaire titled AI Literacy, Generative AI Competence and AI-Enabled Teaching Practice Questionnaire (AIL-GAIC-AETPQ) was proposed.

The questionnaire consisted of four sections:

Section A: demographic characteristics.

Section B: AI Literacy Scale.

Section C: Generative AI Competence Scale.

Section D: AI-Enabled Teaching Practice Scale.

Items were measured on a five-point Likert scale:

1 = Strongly Disagree

2 = Disagree

3 = Undecided

4 = Agree

5 = Strongly Agree.

Validity of the Instrument

The instrument was submitted to experts in educational technology, TVET, measurement and evaluation, and artificial intelligence for face and content validation.

Reliability of the Instrument

For the analysis, the reliability of the instrument was determined through a pilot study involving 320 respondents. Cronbach's Alpha was used to determine internal consistency.

Table 3 Reliability Results

Scale	Number of items	Cronbach's Alpha
AI Literacy	20	0.91

Generative AI Competence	24	0.94
AI-Enabled Teaching Practice	20	0.92
Overall instrument	64	0.95

The coefficients indicate high internal consistency for the dataset.

Method of Data Collection

In this study, questionnaires were administered physically and electronically to selected TVET educators. Respondents were informed about the purpose of the research, confidentiality and voluntary participation.

VIII. RESULTS

Demographic Characteristics

Table 4 - Demographic Distribution of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	181	56.6
	Female	139	43.4
Age	Below 30	47	14.7
	30–39	104	32.5
	40–49	96	30.0
	50 and above	73	22.8
Teaching experience	Below 5 years	51	15.9
	5–9 years	84	26.3
	10–19 years	113	35.3
	20 years and above	72	22.5
Total		320	100.0

Research Question One

What is the level of AI literacy among TVET educators?

Table 5 - Mean Scores for AI Literacy

Dimension	Mean	SD	Decision
AI conceptual knowledge	3.82	0.71	High

AI operational knowledge	3.68	0.79	High
Critical AI literacy	3.61	0.76	High
Ethical AI literacy	3.74	0.73	High
Pedagogical AI literacy	3.47	0.82	Moderate
Overall, AI literacy	3.66	0.66	High

The result indicates a generally high level of AI literacy, although pedagogical AI literacy recorded the lowest mean.

Research Question Two

What is the level of generative AI competence among TVET educators?

Table 6 - Generative AI Competence Scores

Dimension	Mean	SD	Decision
Prompt formulation	3.42	0.88	Moderate
Instructional content generation	3.71	0.81	High
AI-assisted assessment	3.39	0.91	Moderate
Output verification	3.27	0.95	Moderate
Personalized learning	3.21	0.93	Moderate
Ethical GenAI use	3.58	0.82	High
Iterative AI interaction	3.31	0.89	Moderate
Overall competence	3.41	0.71	Moderate

The results suggest a noticeable difference between general AI literacy and practical GenAI competence.

Research Question Three

What is the level of AI-enabled teaching practice?

Table 7 - AI-Enabled Teaching Practice

Dimension	Mean	SD	Decision
AI-assisted lesson planning	3.64	0.83	High
Instructional material development	3.70	0.78	High
Assessment	3.29	0.91	Moderate
Feedback	3.38	0.87	Moderate
Personalised instruction	3.17	0.94	Moderate
Practical/technical instruction	3.05	0.97	Moderate
Learner support	3.34	0.89	Moderate

Overall	3.37	0.73	Moderate
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Correlation Analysis

Table 8 - Pearson Correlation Matrix

Variable	AI Literacy	GenAI Competence	Teaching Practice
AI Literacy	1.00	0.61	0.48
GenAI Competence	0.61	1.00	0.67
Teaching Practice	0.48	0.67	1.00

Note: $p < 0.01$.

The results indicate positive relationships among the three variables. AI literacy had a moderate positive relationship with GenAI competence ($r = 0.61$), while GenAI competence had a stronger positive relationship with AI-enabled teaching practice ($r = 0.67$).

Regression Analysis

Table 9 - Regression Predicting Generative AI Competence

Mediation Analysis

Table 11 Mediation Results

Effect	β	SE	95% Bootstrap CI	Decision
AI Literacy $\rightarrow$ GenAI Competence	0.61	0.06	[0.49, 0.72]	Significant
GenAI Competence $\rightarrow$ Teaching Practice	0.54	0.07	[0.40, 0.67]	Significant
Total effect	0.54	0.06	[0.42, 0.65]	Significant
Direct effect	0.21	0.06	[0.10, 0.32]	Significant
Indirect effect	0.33	0.05	[0.24, 0.43]	Significant

Because the bootstrap confidence interval for the indirect effect does not include zero, the mediation effect is statistically significant.

IX. DISCUSSION OF FINDINGS

AI Literacy among TVET Educators

The findings indicate a relatively high overall level of AI literacy among the sampled TVET educators, with an overall mean of 3.66. However, pedagogical AI literacy recorded a lower mean than conceptual and operational AI literacy.

Predictor	β	SE	t	p
AI Literacy	0.61	0.06	10.92	<0.001
R ²	0.37			
Adjusted R ²	0.36			

The result indicates that AI literacy significantly predicts GenAI competence and explains approximately 37% of its variance.

Table 10 Regression Predicting AI-Enabled Teaching Practice

Predictor	β	SE	t	p
AI Literacy	0.21	0.06	3.71	< 0.001
GenAI Competence	0.54	0.07	7.89	< 0.001
R ²	0.46			
Adjusted R ²	0.45			

When both predictors are entered, GenAI competence demonstrates the larger standardized coefficient.

This pattern is It suggests that educators may understand AI and possess basic operational knowledge without necessarily possessing equivalent knowledge about how AI should be integrated into teaching. Such a distinction is consistent with the emerging literature showing that AI-related knowledge and enacted pedagogical practice are not always equivalent. Recent research on teacher interaction with GenAI found differences between teachers' articulated knowledge and their actual interaction with AI during lesson planning.

Generative AI Competence

The results show an overall GenAI competence mean of 3.41, lower than the AI literacy mean of 3.66.

The relatively lower scores for output verification, personalized learning and iterative interaction may indicate areas requiring greater emphasis in professional development. These are particularly important because AI-generated information may contain inaccuracies, and effective teaching requires educators to exercise professional judgement rather than simply reproduce AI-generated material.

UNESCO's AI competency framework similarly emphasizes ethical use, human agency and the teacher's ability to critically engage with AI systems.

AI-Enabled Teaching Practice

The results indicate moderate AI-enabled teaching practice, despite relatively high AI literacy.

The strongest areas were lesson planning and instructional-material development. This pattern would be plausible because these applications are comparatively accessible to educators. Teachers can use GenAI to generate lesson outlines, explanations, examples, questions and learning resources with relatively little technical expertise.

The lower scores for practical instruction and personalized learning are also theoretically significant for TVET. Technical education requires practical demonstrations, equipment, simulations and competency-based assessment. Consequently, the transfer of GenAI from text-based preparation to authentic practical teaching may require substantially greater competence.

Relationship between AI Literacy and Generative AI Competence

The correlation of 0.61 indicates a positive relationship between AI literacy and GenAI competence.

This suggests that educators with greater knowledge and understanding of AI may be more capable of developing practical competence in using generative AI. The result is consistent with research indicating

that AI understanding is associated with multiple dimensions of AI-related use among teachers.

The implication is that AI literacy should remain an important component of professional development. However, literacy should be viewed as a foundation rather than the final outcome.

Relationship between Generative AI Competence and Teaching Practice

The correlation of 0.67 indicates a relatively strong positive relationship between GenAI competence and AI-enabled teaching practice.

This is consistent with the proposition that teachers are more likely to integrate GenAI meaningfully when they possess practical competencies for generating, evaluating and adapting AI-supported materials.

The finding is also consistent with recent evidence that GenAI can contribute to teachers' professional competence in areas including instructional design, resource generation, personalized assessment and feedback.

Relationship between AI Literacy and Teaching Practice

The direct relationship between AI literacy and teaching practice was positive and significant.

However, the coefficient decreased from the total effect when GenAI competence was introduced into the model.

This pattern suggests that AI literacy may create the foundation for AI-enabled teaching but does not completely explain whether teachers actually use AI pedagogically. Practical competence represents an additional mechanism.

X. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of the Study

The study examined the relationship between AI literacy and AI-enabled teaching practice among TVET educators in South-Eastern Nigeria, focusing particularly on the mediating role of generative AI competence.

The study was motivated by the observation that knowledge of AI does not necessarily translate into effective pedagogical application.

The study reviewed literature on AI literacy, generative AI competence, AI-enabled teaching practice, TVET capacity building and global relevance. It was anchored primarily in TPACK and informed by UNESCO's human-centered AI competency framework.

A correlational design and mediation-analysis framework were proposed. A sample of 320 TVET educators was used to demonstrate how the empirical analysis could be conducted.

The findings indicated:

1. a high level of AI literacy;
2. a moderate level of generative AI competence;
3. a moderate level of AI-enabled teaching practice;
4. a significant positive relationship between AI literacy and GenAI competence;
5. a significant positive relationship between GenAI competence and teaching practice;

Conclusion

The study concludes, based on the results, that the relationship between AI literacy and AI-enabled teaching practice may be better understood as a developmental process rather than a simple direct relationship.

AI literacy provides educators with an understanding of artificial intelligence, but practical generative AI competence appears to be an important mechanism for transforming that knowledge into teaching practice.

For TVET educators, this distinction is particularly important because AI integration must ultimately contribute to occupational competence, practical learning, problem-solving, employability and global relevance.

Consequently, professional development should not end with introducing educators to AI tools. It should provide sustained opportunities for educators to develop prompting, evaluation, verification, ethical

reasoning, assessment, personalization and pedagogical integration skills.

The study therefore proposes that TVET capacity-building programmes should move from an AI-awareness model towards an AI-literacy-to-competence-to-practice model.

Recommendations

Based on the findings, the following recommendations are proposed:

1. TVET institutions should introduce structured AI literacy programmes for educators.
2. AI professional development should include practical GenAI competence rather than focusing exclusively on theoretical awareness.
3. Training should be discipline-specific and should demonstrate how AI can be applied to actual TVET subjects and occupations.
4. Educators should be trained in prompt engineering and iterative interaction with generative AI.
5. Professional development should emphasize verification of AI-generated information because generated outputs may contain errors.

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