

ARTIFICIAL INTELLIGENCE AWARENESS AND DIGITAL COMPETENCIES AMONG CARPENTRY AND JOINERY CRAFT TEACHERS' IN TECHNICAL COLLEGES IN EDO STATE

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Abstract

This research explored the level of artificial intelligence (AI) awareness and its association with digital competencies among carpentry and joinery (C&J) craft teachers' in technical colleges within Edo State, situated in the educational technology domain. The investigation focused on assessing the extent of AI awareness, evaluating the digital competence of these instructors, and analyzing the correlation between AI awareness and digital competence. Employing a correlational survey methodology, data were gathered from 21 C&J craft educators through structured questionnaire. Analytical procedures utilized descriptive statistics, Pearson Product Moment Correlation, and one-way ANOVA to interpret the findings. Results indicated that the participants demonstrated elevated levels of both AI awareness and digital competence. Moreover, a robust, positive, and statistically significant correlation between AI awareness and digital competence was identified ($r = .560$, $p < .001$). Notably, demographic variables such as age, gender, and teaching experience did not exert a significant impact on either AI awareness or digital competence ($p > .05$). The study concluded that advancing AI awareness plays a critical role in enhancing digital competencies among C&J educators, thereby facilitating technology-enhanced pedagogical strategies. Accordingly, it advocated for continuous professional development programs, institutional backing for AI integration and inclusive capacity-building efforts across all trade disciplines to foster effective digital transformation within technical education institutions.

Keywords: Artificial Intelligence, Digital Competences, TVET Teachers, Technical colleges.

Introduction

The rapid advancement of technology and artificial intelligence (AI) is fundamentally transforming educational systems globally, significantly altering approaches to teaching, learning, and skills development (Luckin et al., 2016). Within the domain of Technical and Vocational Education and Training (TVET), these innovations present opportunities to update curricula and pedagogical strategies, thus better preparing students to meet contemporary industrial demands (UNESCO, 2021). This is particularly pertinent for technical colleges tasked with equipping students with essential trade skills, such as those in carpentry and joinery craft.

Historically, carpentry and joinery craft have been grounded in traditional craftsmanship and manual dexterity. However, the integration of AI technologies such as intelligent tools, AI-assisted design software, digital fabrication, and virtual reality has begun to revolutionize both instructional methods and professional practice in these fields (Kong & Khan, 2020). For example, AI-powered computer-aided design (CAD) platforms enable enhanced precision in project planning and customization, while digital measurement and modelling technologies improve accuracy and efficiency in joinery tasks (Zhou et al., 2022).

To leverage these advancements effectively, teachers in carpentry and joinery must develop advanced digital competencies alongside a sound conceptual understanding of AI principles pertinent to their disciplines (European Commission, 2018). Digital competence in this context refers to the confident, critical utilization of digital technologies within professional practice,

communication, pedagogy, and evaluative processes. For carpentry and joinery teachers, this entails expertise in digital design software, familiarity with AI-enhanced tools, capabilities in online collaboration, critical assessment of digital resources, and facilitation of learners' engagement with technology.

Crucially, focusing on the Nigerian context, especially Edo State, technical colleges serve a vital role in preparing competent craftsmen who contribute substantively to the construction sector and allied industries. Despite this importance, there is a paucity of research examining the levels of AI awareness and digital competencies among carpentry and joinery craft teachers in technical colleges. Such inquiry is critical as these teachers not only impart technical expertise but also shape how emerging craftsmen incorporate technological innovations in their professional activities.

Furthermore, personal variables including gender and teaching experience may influence teachers' engagement with AI and digital tools, affecting their preparedness and ability to integrate these technologies into instructional practices. Investigating these factors will yield valuable insights into professional development requirements and aid in designing targeted interventions to enhance digital literacy and AI adoption within vocational education for carpentry and joinery craft. This study aims to assess the awareness of artificial intelligence (AI) and its correlation with the digital competencies of carpentry and joinery teachers in technical colleges located in Edo State.

Outcomes will help identify existing gaps in teachers' readiness and inform policy and educational practice to bolster AI-driven innovation in technical education programs. Ultimately, this will contribute to elevating the quality of skills training and improving graduate employability in alignment with evolving industrial demands.

Statement of the Problem

In the field of TVET, it is theoretically anticipated that educators possess a comprehensive understanding of Artificial Intelligence (AI) and exhibit advanced digital competencies. These educators are expected to proficiently incorporate AI-driven technologies into curriculum design, instructional delivery, and evaluation processes, thereby imparting students with competencies pertinent to contemporary technologies and the demands of the digital economy. TVET institutions ideally facilitate ongoing professional development and actively encourage the integration of AI within pedagogical practices. Nonetheless, empirical observations indicate that numerous TVET instructors in Nigerian universities demonstrate limited familiarity with AI principles and applications. Preliminary anecdotal data reveal that AI integration within TVET programs remains minimal, compounded by insufficient training opportunities for educators in emerging digital technologies. Variability in digital proficiency is evident, with many educators relying solely on fundamental ICT tools rather than embracing advanced or AI-enhanced pedagogical methodologies. The issue is exacerbated by infrastructural limitations, inadequate professional development frameworks, and a lack of comprehensive institutional policies fostering digital transformation in education. Consequently, despite the increasing global prioritization of digital transformation in educational contexts, there exists a significant research lacuna concerning the extent of AI awareness among TVET educators and its association with their digital competence within Nigerian universities. Existing literature predominantly addresses general ICT utilization or digital literacy in mainstream education, thereby neglecting the specific readiness of technical educators to integrate AI advancements. Bridging this knowledge gap is imperative for synchronizing technical education with worldwide technological progressions and aligning with national developmental objectives.

As noted by Okolie et al. (2021), the slow adoption of AI and advanced digital technologies in Nigerian TVET institutions is largely attributed to a lack of adequate teacher training and infrastructural deficits, highlighting the critical need for focused research on educators' AI awareness and competence to improve educational outcomes in the technical sector.

Purpose of the Study

This study examined the relationship between awareness of AI and digital competencies among technical college teachers in Edo State. Specifically, the study was conducted to:

1. Determine the level of awareness of AI among carpentry and joinery craft teachers' in technical colleges in Edo State.
2. Examine the level of digital competence among carpentry and joinery craft teachers' in technical colleges in Edo State.
3. Ascertain the relationship between AI awareness and digital competence among carpentry and joinery craft teachers' in technical colleges in Edo State.

Methods

In this study, a correlational survey design was employed, representing a non-experimental research approach that utilizes surveys to quantify two or more variables and evaluate the statistical associations between constructs without any experimental manipulation (Devi et al., 2022). This methodology was appropriate as it facilitates an exploration of the relationship between artificial intelligence (AI) awareness and digital competence.

The research focused on six technical colleges in Edo State that offer carpentry and joinery programs. The target population comprised 21 instructors specializing in carpentry and joinery across these institutions. A priori power analysis was conducted using G*Power 3.1.9.7 to establish the minimum sample size necessary for detecting a medium effect size in a bivariate correlation context. The analysis parameters included a t-test, a medium effect size ($\rho = .30$) following Cohen's standards, a significance level set at .05, and statistical power of 95%. The bivariate normal correlation model was chosen given the study's objective to investigate the association between two continuous variables. Results from G*Power indicated that a minimum sample of 19 participants was required to achieve the desired power. To accommodate possible non-responses or incomplete data, an additional 15% was added, yielding a target sample size of 26 participants.

The sample was selected through convenience sampling, reflecting pragmatic considerations during data collection, which involved multiple visits to the institutions. Since teacher availability varied, oversampling was necessary to ensure the minimum required sample size was obtained.

Data were collected via a self-developed questionnaire comprising three sections: Section A gathered personal data (gender and years of teaching experience); Section B contained eight items assessing AI awareness among carpentry and joinery instructors, measured on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5); Section C included nine items evaluating digital competence using a five-point Likert scale from Not Competent (1) to Highly Competent (5).

To establish content validity, the questionnaire underwent expert review by three faculty members from the Ambrose Alli University Ekpoma, two from Department of Vocational and Technical Education, and one from Measurement and Evaluation. Their feedback was incorporated into the final instrument.

A pilot study, involving 10 carpentry and joinery instructors outside the study population, was conducted for reliability assessment, yielding a Cronbach's alpha coefficient of .905, indicating high internal consistency. Questionnaires were administered and collected over a three-week period, resulting in 21 valid responses.

Descriptive statistics, including means and standard deviations, were utilized to analyze the levels of AI awareness and digital competence, with mean scores interpreted against a benchmark of 3.50. The relationship between AI awareness and digital competence was examined using Pearson's Product Moment Correlation coefficient.

Results

The analysis and results are presented.

Research Question 1: What is the level of awareness of artificial intelligence among carpentry and joinery craft teachers in technical colleges in Edo State?

Table 1

Level of Awareness of Artificial Intelligence among Carpentry and Joinery Craft Teachers

Variable	Mean	Standard Deviation	Interpretation
AI Awareness (Overall)	4.12	.60	High

(N = 21)

The data presented in Table 1 indicate that carpentry and joinery craft teachers demonstrated a substantial level of awareness regarding AI, evidenced by an overall mean score of 4.12 (SD = .60). The mean scores for individual survey items spanned from 4.01 to 4.31, reflecting uniformly elevated awareness across various dimensions of AI. These findings imply that the majority of participants possess a comprehensive understanding of AI principles and their practical implementations within educational settings.

Research Question 2: What is the level of digital competence among carpentry and joinery craft teachers in technical colleges in Edo State?

Table 2

Level of Digital Competence among Carpentry and Joinery Craft Teachers

Variable	Mean	Standard Deviation	Interpretation
Digital Competence (Overall)	4.11	.50	High

(N = 21)

Table 2 illustrates that carpentry and joinery craft teachers exhibited a considerable degree of digital proficiency, as indicated by an aggregate mean score of 4.11 (SD = .50). The individual item means ranged between 3.72 and 4.20, signifying a robust capability in applying digital technologies for instructional and professional purposes.

Research Question 3: Is there a significant relationship between AI awareness and digital competence among carpentry and joinery craft teachers in technical colleges in Edo State?

Table 3

Relationship between AI Awareness and Digital Competence

Variables	R	p-value	Decision
AI Awareness	.560	< .001	Significant Positive Relationship
Digital Competence			

The data presented in Table 3 illustrate the results of the Pearson Product Moment Correlation analysis, indicating a robust positive correlation between AI awareness and digital competence ($r = .560$, $p < .001$). This finding suggests that an increase in teachers' AI awareness corresponds with an enhancement in their digital competence. Furthermore, the statistical significance of this relationship implies that the observed association is unlikely due to random variation. Consequently, Hypothesis 1, which posited no significant relationship between AI awareness and digital competence among carpentry and joinery craft teachers in technical colleges in Edo State, was rejected.

Hypotheses

1. There is no significant relationship between AI awareness and digital competence among carpentry and joinery craft teachers in technical colleges in Edo State.

2. There is no significant difference in AI awareness based on gender and years of teaching experience among carpentry and joinery craft teachers in technical colleges in Edo State.
3. There is no significant difference in digital competence based on gender and years of teaching experience

Table 4
Summary of the Hypotheses Results

S/n	Null Hypotheses Decision	Statistical Test	Result
1.	No significant relationship exists between AI awareness and digital competence	Pearson Correlation	Significant
	Rejected	($r = .655, p < .001$)	
2.	No significant difference in AI awareness based on gender and years of experience	ANOVA and t-test	in all cases
	Retained	$p > .05$	
3.	No significant difference in digital competence based on gender, and years of experience	ANOVA and t-test	in all cases
	Retained	$p > .05$	

Table 4 presents a summary of the hypotheses evaluated in this research. Among these, only Hypothesis 1 yielded a p-value below .001, leading to its rejection, which indicates a significant relationship between AI awareness and digital competence. Conversely, for Hypotheses 2 and 3, personal variables such as gender, and years of experience did not demonstrate a significant effect on the AI awareness and digital competencies of carpentry and joinery craft teachers within technical colleges in Edo State.

Discussion

The research revealed that carpentry and joinery craft teachers in technical colleges within Edo State demonstrate a high level of awareness regarding artificial intelligence (AI). This outcome indicates that AI technologies have been increasingly recognized and incorporated within the technical college environment, enabling teachers to maintain a consistent understanding of AI applications pertinent to teaching and learning in carpentry and joinery disciplines. The elevated level of awareness may also reflect the impact of institutional initiatives such as workshops, online educational platforms, and the broad availability of AI-powered digital tools. This finding aligns with Ekwevugbe (2025), who documented a comparable high degree of AI tool awareness among academic lecturers. Consequently, the participants exhibit the requisite technological proficiency to leverage AI resources effectively in pedagogical delivery and professional practices. Also, Madu and Musa (2024) that found moderate awareness of AI and digital competences among lecturers. A further significant finding of this study is the identification of a robust and statistically significant positive correlation between AI awareness and digital competence, suggesting that teachers with greater knowledge of AI concurrently possess more advanced digital skills. Additionally, the study found that personal variables, including gender, and years of teaching experience, do not significantly affect AI awareness or digital competence levels. In support, Dringó-Horváth et al. (2025) also observed that there is no one-size-fits-all approach to AI, but a tailored approach to integration and utilization.

In conclusion, these results imply that institutional strategies aimed at fostering AI integration within carpentry and joinery craft teachers should prioritize comprehensive capacity-building initiatives that extend beyond a single discipline, encompassing other Trade and TVET subjects to promote broader adoption and integration.

Conclusion and Recommendations

The research indicates that carpentry and joinery teachers within technical colleges in Edo State exhibit elevated proficiency in both artificial intelligence awareness and digital competence. Moreover, there exists a robust correlation between AI awareness and digital competence, implying that enhancements in one area tend to bolster the other. Nevertheless, considering the practical characteristics of TVET trade disciplines, the study recommends the continued inclusive incorporation of these competencies.

1. Technical college's management and relevant educational stake holders should build more on regular training and retraining programmes for teachers on AI applications to sustain and deepen existing awareness levels.
2. Various areas of trade subjects in technical colleges should include practical AI literacy modules into staff development initiatives to facilitate effective instructional innovation.
3. Policymakers should develop robust guidelines for responsible and pedagogically sound integration of AI technologies into TVET instruction.
4. Government should provide AI supporting facilities to technical colleges.

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