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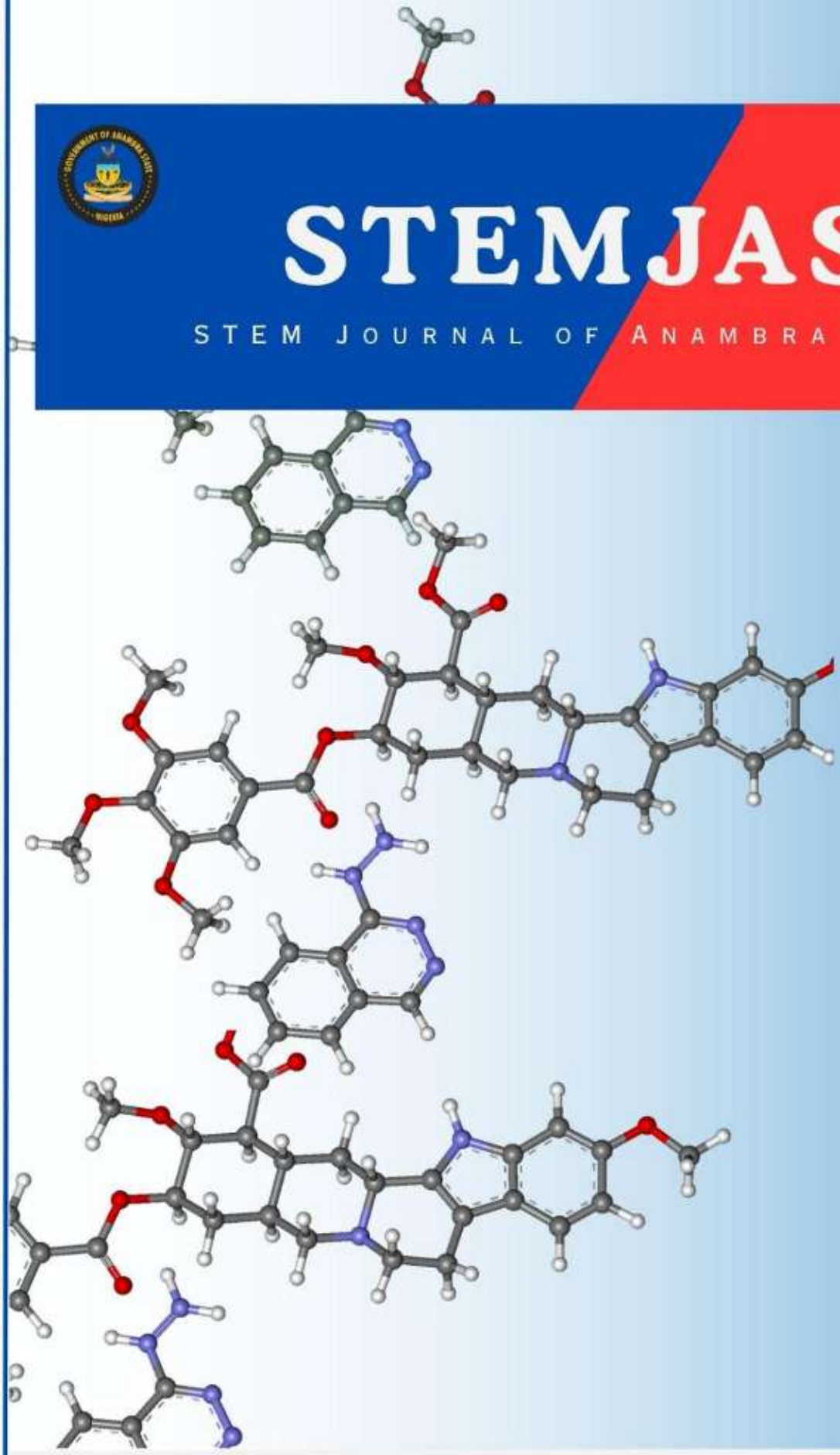

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EDITORIAL

STEM Journal of Anambra STAN (STEMJAS) is a publication of **Science Teachers Association of Nigeria, Anambra State Chapter.** STEMJAS is developed to disseminate information on Science, Technology, Engineering and Mathematics (STEM) Education to teachers, teacher-trainers, researchers and other interested persons. Articles that are of relevance to STEM education are published in this journal. We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Ebele C. Okigbo
Editor-in-Chief

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TEACHERS' READINESS AND COMPETENCE IN INTEGRATING AI-BASED EDUCATIONAL TOOLS IN COMPUTER STUDIES CLASSROOMS IN NNEWI EDUCATION ZONE, ANAMBRA STATE, NIGERIA

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Abstract

The study examined teachers' readiness and competence in integrating Artificial Intelligence (AI)-based educational tools in Computer Studies classrooms within the Nnewi Education Zone of Anambra State, Nigeria. Using A descriptive survey design, data were collected from 24 Senior Secondary II Computer Studies teachers across 48 public secondary schools in Nnewi Education zones. No sampling was done as the population was manageable. A self-structured 30-item questionnaire titled *Teachers' AI Integration Readiness and Competence Scale (TAIRCS)* was used for data collection, with a reliability coefficient of 0.85 (Cronbach's Alpha). Data were analyzed using mean and standard deviation to address the research questions. Results indicated a moderate level of readiness among Computer studies teachers toward integrating AI-based tools, with higher readiness in awareness and attitude but low competence in AI tool utilization. The study concluded that although teachers demonstrated willingness to integrate AI technologies, inadequate training and insufficient access to AI-based resources limited effective implementation. It was recommended that regular capacity-building workshops, improved digital infrastructure, and the inclusion of AI literacy in teacher education curricula be prioritized to promote effective integration of AI tools in SII Computer Studies classrooms.

Keywords: *Teachers Readiness, competence, Computer Studies, AI technologies*

Background to the Study

The rapid advancement of artificial intelligence (AI) in the last decade has significantly transformed global educational systems. AI-driven tools such as intelligent tutoring systems, automated assessment platforms, virtual laboratories, and adaptive learning environments are

increasingly being integrated into teaching and learning processes (Zawacki-Richter et al., 2019; Holmes et al., 2022). In education, ICT plays a critical role in expanding access to learning resources, improving teaching strategies, and supporting student-centered learning in secondary schools (Muogbo & Nnoli.,2025). In Computer Studies classrooms in particular, these tools have demonstrated the potential to enhance instructional delivery, promote individualized learning, and improve students' problem-solving and computational skills (Chen et al., 2021). As AI technologies become more accessible and user-friendly, their integration into school systems has shifted from a complementary innovation to a necessary component of 21st-century pedagogy.

Teachers' readiness is a degree of preparedness**,** openness**,** and psychological disposition that teachers possess toward adopting new instructional innovations such as AI tools while Teachers' competence refers to the skills, abilities, and mastery needed to effectively use AI-based educational tools in teaching. However, the successful adoption and effective use of AI-based educational tools depend heavily on teachers' readiness and competence. Teachers play a central role in selecting, applying, and managing these technologies to facilitate meaningful learning experiences. Studies show that teachers' technological skills, pedagogical knowledge, attitudes toward AI, and willingness to innovate greatly influence the extent of effective classroom integration (Ifenthaler & Yau, 2020; Ameen & Adegbija, 2023). In many developing contexts, including Nigeria, teachers' preparedness to utilize AI tools remains a major concern. Issues such as inadequate ICT infrastructure, limited professional development opportunities, and low digital literacy continue to impede teachers' capacity to incorporate emerging technologies into teaching (Oluwatola & Ajani, 2022; Okonkwo, 2023).

In Nnewi Education Zone of Anambra State, these challenges are particularly evident, while the government of Anambra State has made commendable strides in promoting ICT education, there is limited empirical evidence on the level of Computer Studies teachers' readiness and competence in integrating AI-based tools. The unique nature of Computer studies demands practical, interactive, and technological learning experiences which makes teacher competence even more crucial. Research suggests that AI integration in computer-related subjects requires not only technical proficiency but also pedagogical competence in using AI tools to support problem-solving, programming, and hands-on learning (Kong et al., 2021; UNESCO, 2023). Teachers' readiness factors should be well understood in such a way to access digital resources, training exposure, confidence level, and attitudes toward AI and therefore should be critical in designing targeted interventions. Such evidence is essential for guiding educational planners, policymakers, and teacher-training institutions in developing programs that strengthen digital and AI competencies among Computer Studies teachers.

Therefore, the study examines the readiness and competence of Computer Studies teachers in integrating AI-based educational tools in Nnewi Education Zone through identifying the enabling factors and barriers affecting AI integration, the study aims to generate insights that will

support policy formulation, professional development initiatives, and strategic planning to enhance the quality of Computer Studies education in Anambra State and beyond.

Statement of the Problem

The integration of Artificial Intelligence (AI) into teaching and learning has become a global priority for improving instructional delivery and learning outcomes, especially in technology-oriented subjects such as Computer Studies. AI-based educational tools such as intelligent tutoring systems, adaptive learning platforms, and automated assessment applications offers opportunities for personalized learning, enhanced student engagement, and improved mastery of computational concepts. Despite these benefits, evidence suggests that many secondary school teachers, particularly in Anambra State, still struggle to effectively incorporate these tools into classroom instruction. In Nnewi Education Zone of Anambra State**,** the extent to which Computer studies teachers are prepared and competent to integrate AI-based tools remains largely unclear. Anecdotal reports and preliminary observations indicate that while AI technologies are increasingly promoted, teachers may lack the necessary digital skills, pedagogical competence, or confidence required to utilize them effectively. Inadequate ICT infrastructure, limited training in emerging technologies, and minimal access to AI-enabled tools may further hinder teachers' ability to adopt innovative instructional practices. Moreover, the unique practical demands of Computer Studies as a subject that requires hands on activities with technological tools makes teacher readiness and competence even more critical. Without clear evidence of teachers' preparedness, it becomes difficult for school administrators, policymakers, and training institutions to design targeted interventions that support effective AI integration. Consequently, students may continue to experience outdated or less engaging instructional methods, limiting their exposure to emerging digital skills required for the 21st-century workforce.

Therefore, there is need to examine the level of readiness and competence of Computer Studies teachers in integrating AI-based educational tools in Nnewi Education Zone

Purpose of the study:

The main purpose of this study is to assess teachers' readiness and competence in integrating AI-based educational tools in Computer Studies classrooms in Nnewi Education Zone, Anambra State.

Specifically, the study seeks to:

1. To assess the level of teachers' readiness to integrate AI-based educational tools in Computer studies classrooms within Nnewi Education Zone.
2. To evaluate the competence of Computer studies teachers in using AI-based educational tools for instructional purposes.

3. To identify the challenges and barriers faced by teachers in the effective integration of AI-based educational tools in Computer studies instruction.

Research questions:

To guide the study, the following research questions are posed:

1. What are the level of teachers' readiness in integrating AI-based educational tools in Computer studies classrooms in Nnewi Education Zone?
2. What are the level of Computer studies teachers' competence in using AI-based educational tools for instructional purposes
3. What are the challenges and barriers faced by teachers in the effective integration of AI-based educational tools in Computer studies instruction.

Review of Related Literature

Teachers' readiness is an extent to which teachers are prepared, willing, and able to adopt and use a new educational innovation like AI-based educational tools in their teaching. A recent empirical study in Northern Ghana assessed teachers' readiness to use AI tools in the classroom by Idrissu, H.M. & Idrissu, S.A. (2025) found that readiness depends significantly on factors such as prior AI familiarity, self-efficacy, perceived benefits, and institutional support. In Nigeria, Eke, O.E. (2024). Study on Assessing the readiness and attitudes of Nigerian teacher educators towards adoption of artificial intelligence in educational settings found generally positive attitudes towards AI adoption in education. However, major constraints included lack of adequate infrastructure, insufficient training, and limited policy/institutional support suggesting that attitude alone does not guarantee effective integration.

Teachers competence in Integrating AI Based Education Tools

Artificial Intelligence (AI) is rapidly reshaping educational practice from automated feedback and adaptive learning to lesson-design assistance with generative models. As opined by S. Wang et al 2024. However, scholars consistently identify *teacher competence* as the critical mediator between available AI tools and improved student outcomes. S. Wang et al (2024) In short: AI's classroom potential depends heavily on whether teachers have the knowledge, skills, ethical judgment, and institutional supports to use it well.

Link between Teachers readiness and Teachers Competence

Teacher quality increasingly distinguishes readiness (the preparedness, confidence, and willingness of teachers to perform particular tasks) from competence (the observable knowledge,

skills and attitudes needed to perform effectively) as opined by M.A. Ayanwale et al (2022). However, many studies treat these concepts as closely connected: greater readiness tends to be associated with higher demonstrated competence, and both are necessary for effective instruction and improved student outcomes.

Several authors define teacher readiness as a composite of cognitive, affective and logistical factors on subject knowledge, self-efficacy, attitudes toward innovation, and access to resources (e.g., training, infrastructure). D.S Ozturk (2018) explained Teacher competence as often operationalized as pedagogical knowledge, classroom management, assessment skills, and subject-matter mastery. Studies that explicitly model both concepts usually treat readiness as a precursor or enabler of competent performance.

In summary, the literature converges on the view that teacher readiness and teacher competence are distinct but interrelated**.** Readiness is shaped by training, confidence, and resources which enables teachers to deploy pedagogical skills that constitute competence. Strengthening both, within supportive institutional contexts, is essential for meaningful classroom change and improved student learning. Future research should prioritize longitudinal and intervention studies with standardized measures to clarify causal pathways.

Research question 1: What are the level of teachers' readiness in integrating AI-based educational tools in Computer studies classrooms in Nnewi Education Zone?

Table 1: Level of teachers' readiness in integrating AI-based educational tools

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Teachers'	Equal variances assumed	6.571	.012	.276	118	.783	.178	.644	-1.097	1.453

Readiness	Equal variances not assumed	.294	110.640	.769	.178	.604	-1.019	1.374	

From the analysis finding, it observed that the p valve of 0.783 is greater than t-test value of 0.05, this shows the teachers' readiness in integrating AI-based educational tools in teaching of computer studies classroom in Nnewi Zone, Anambra State, Nigeria. In other words, since p = 0.783 > 0.05**,** the result shows no significant difference in teachers' readiness based on the grouping variable (likely gender). However, the mean difference (.178) indicates that teachers generally demonstrate a moderate level of readiness**,** but not strong enough to show major variation across groups.

Research Question 2: What are the level of Computer studies teachers' competence in using AI-based educational tools for instructional purposes?

Table 2: Level of Computer studies teachers' competence in using AI-based educational tools

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Teachers' Competence	Equal variances assumed	.612	.436	-2.083	118	.039	-.858	.412	-1.673	-.042

	Equal variances not assumed			-2.154	102.593	.034	-.858	.398	-1.648	-.068

The result above indicates that the p value of 0.039 is greater than the t-test value of 0.05, which shows that computer teachers in Nnewi Education Zone have slightly competence in AI-base tools in handling computer studies in the zone. $p = 0.039 < 0.05$, meaning there is a significant difference in teachers' competence levels based on the grouping variable. The negative mean difference (-.858) indicates that teachers generally have low competence in using AI tools and that one group performed slightly better than the other.

Research Question 3: What are the challenges and barriers faced by teachers in the effective integration of AI-based educational tools in Computer studies instruction.

Table 3: Challenges and barriers faced by teachers in the effective integration of AI-based educational tools

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Challenges	Equal variances assumed	.432	.512	.024	118	.981	.009	.369	-.722	.740
	Equal variances not assumed			.023	76.266	.982	.009	.392	-.772	.790

The result indicated that the p value of 0.981 is greater than the t-test value of 0.05, showing that there is an observable challenge in amenities and tools provision that will aid in integrating AI-base tools in teaching computer studies in computer classrooms in Nnewi Education Zone. However, Since p = 0.981 > 0.05**,** there is no significant difference in the challenges reported across groups. This means the challenges faced by teachers are common and uniform, affecting all teachers similarly.

Discussion of Findings

The findings indicate that teachers in Nnewi Education Zone are moderately ready to integrate AI-based educational tools, but their competence in actual usage remains low**.** This aligns with contemporary literature showing that educators often have positive attitudes toward technological innovations but lack the skills and training needed for effective implementation. The moderate level of readiness suggests that teachers are aware of AI possibilities, show interest, and are willing to integrate AI tools into computer studies instruction. However, readiness is not enough to guarantee implementation. Previous studies (Eke, 2024; Idrissu & Idrissu, 2025) similarly show that Nigerian teachers often express willingness but are hindered by structural and training limitations. The significant difference observed shows that competence is not evenly distributed, and overall competence remains low. Teachers struggle with three (3) things which are Lack of hands-on training in A, Inadequate exposure to AI-based instructional tools and Limited confidence in using advanced digital technologies, this confirms Wang et al. (2024), who emphasized that teacher competence is the strongest determinant of successful AI integration. Challenges such as lack of digital infrastructure, poor access to AI tools, insufficient training opportunities, unstable electricity, and limited ICT support were commonly reported. The lack of significant difference across groups indicates that these challenges are systemic, not individual. This finding is consistent with reports across Sub-Saharan Africa that highlight infrastructure gaps as the greatest barrier to AI-based instruction.

Conclusion

The study concludes that Teachers in Nnewi Education Zone demonstrate moderate readiness to integrate AI-based educational tools, reflecting positive attitudes and awareness, it was discovered that Teachers' competence in the practical use of AI tools remains low, indicating a gap between willingness and actual skill capability. Systemic challenges, including lack of infrastructure, inadequate training, and limited availability of AI tools, hinder effective integration. Gender and teaching experience have no significant influence on readiness or challenges, but competence differs significantly, highlighting unequal exposure or training opportunities. In summary, the

successful integration of AI-based educational tools in Computer Studies classrooms requires structured training, improved infrastructure, and institutional support.

Recommendations

Based on the findings, the following recommendations were made:

1. Anambra State Ministry of Education should develop clear policies supporting AI integration at the secondary school level.
2. The School Management should regularly organize AI-focused professional development workshops for Computer Studies teachers.
3. Government and school management should provide AI-enabled educational software, devices, stable internet access, and power supply.
4. Regular assessments should be conducted to measure improvements in teacher competence and identify emerging needs while successful schools should be used as models for others to replicate.

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