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## Research Article

# School Leadership, Teachers' Digital Competence, and AI Integration in Civic Education Classrooms in Zamfara State, Nigeria

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**Abstract.** This study examined the relationships among school leadership practices, teachers' digital competence, and artificial intelligence (AI) integration in Civic Education classrooms in Zamfara State, Nigeria. Specifically, the study determined the relationship between school leadership practices and AI integration, examined the relationship between teachers' digital competence and AI integration, and determined the combined contribution of school leadership practices and teachers' digital competence to AI integration. A quantitative correlational survey research design was adopted. The population comprised Civic Education teachers in public secondary schools in Zamfara State, from which 384 teachers were selected through a multistage sampling procedure. Data were collected using the School Leadership, Teachers' Digital Competence, and AI Integration Questionnaire (SLTDCAIQ), which was validated by experts and yielded an overall Cronbach's alpha reliability coefficient of 0.86. Data were analysed using mean, standard deviation, Pearson Product-Moment Correlation, and multiple regression analysis at the 0.05 level of significance. The findings revealed significant positive

relationships between school leadership practices and AI integration,  $r(382) = .612$ ,  $p < .001$ , and between teachers' digital competence and AI integration,  $r(382) = .684$ ,  $p < .001$ . Multiple regression further showed that school leadership practices ( $\beta = .302$ ,  $p < .001$ ) and teachers' digital competence ( $\beta = .526$ ,  $p < .001$ ) made significant contributions to AI integration, with teachers' digital competence having the larger statistical contribution. The study concluded that supportive school leadership and teachers' digital competence were significantly associated with AI integration in Civic Education classrooms. It recommended continuous professional development, improved digital infrastructure, supportive leadership, and clear guidelines for responsible AI use.

**Keywords:** artificial intelligence integration; Civic Education; digital competence; secondary schools; school leadership.

## INTRODUCTION

The rapid development of artificial intelligence (AI) is transforming educational systems by creating new opportunities for teaching, learning, assessment, instructional planning, and school administration. AI tools can generate learning materials, support personalised instruction, provide feedback, and assist teachers in various professional tasks (Muhammad, 2026). However, effective AI integration depends not only on the availability of technology but also on teachers' competence and the institutional conditions within which they work. Studies indicate that teachers' AI integration is influenced by individual, technological, and environmental factors (Li et al., 2025). School leadership is therefore increasingly important because school leaders influence institutional priorities, resource allocation, professional development, innovation, and the creation of supportive organisational cultures. Zeng et al. (2025) found that principals' digital leadership was associated with teachers' competence in AI integration through resource provision, training, collaboration, and supportive school cultures. Similarly, Gkoutzinis et al. (2024) emphasised that increasing digitalisation requires school leaders to adapt their practices to changing technological conditions, while Alarcón et al. (2025) and Suhartanto et al. (2025) linked digital and strategic leadership with teachers' readiness and approaches to AI adoption.

Teachers' digital competence is another important factor in AI integration. Beyond basic technological skills, it involves the ability to select, evaluate, create, and use digital technologies effectively, ethically, safely, and pedagogically. Mafara and Muhammad (2026) stated that, in the AI era, teachers are expected to evaluate AI-generated information, recognise possible bias and inaccuracies, address privacy concerns, and connect AI tools with appropriate instructional objectives. Li et al. (2025) reported considerable differences in teachers' levels of generative AI integration, while Wang et al. (2026) highlighted the importance of AI-related technological and pedagogical competence. Similarly, Shi (2025) identified technological proficiency, pedagogical integration, student preparation, professional development, and ethical awareness as important dimensions of teachers' generative AI competence. These findings indicate that teachers' digital competence extends beyond the ability to operate digital devices and includes the capacity to make informed pedagogical and ethical decisions when using emerging technologies.

These issues are particularly relevant to Civic Education because the subject focuses on citizenship, society, governance, culture, contemporary issues, critical thinking, democratic values, and responsible decision-making. AI can assist Civic Education teachers in developing instructional materials, case studies, inquiry activities, simulations, and different perspectives on social and civic issues (Kanonhaki & Muhammad, 2026). However, teachers must be able to evaluate AI-generated information and prevent biased, inaccurate, or misleading content from undermining meaningful learning. In Nigeria, Eguagie (2025) found a significant relationship between teachers' digital literacy and AI adoption in Social Studies assessment, while Onyepke et al. (2025) reported that although AI use in Social Studies instruction was generally low, technology literacy was associated with more effective integration. Eze (2025) also found that principals' technology leadership was associated with teachers' technology integration. Although these studies were conducted in Social Studies and related educational contexts, their findings provide relevant empirical insights into the role of teachers' digital competence and school leadership in technology integration.

School leadership may strengthen AI integration by improving teachers' digital competence through professional development, access to digital resources, collaboration, and continuous learning opportunities. Qu and Mydin (2026) observed that principals influence digital resources, teachers' motivation, and technology integration, although their efforts may be constrained by inadequate infrastructure, funding, training, and resistance to change. Likewise, Kalogeratos et al. (2026) highlighted the interconnected relationship among transformational leadership, teachers' digital competence, and AI integration. In Nigeria, Akinola et al. (2026) found that many basic school leaders demonstrated positive attitudes towards AI but had limited AI-specific knowledge, infrastructure, and professional development opportunities. Similarly, Oyefeso et al. (2025) reported gaps in school principals' professional and infrastructural readiness for AI integration in secondary schools. These findings suggest that school leadership can provide important organisational conditions for teachers' effective use of AI, although contextual constraints may limit the extent to which such support can be provided.

The relationship between leadership, digital competence, and AI integration can also be understood from the perspective of organisational and technological change in education. Effective leadership can create an environment in which teachers receive opportunities to acquire new digital skills, experiment with emerging technologies, collaborate with colleagues, and receive technical support (Muhammad & Saraki, 2026). Teachers' digital competence, in turn, may enable them to use AI tools more confidently and appropriately for instructional purposes. Berkovich (2025) emphasised that AI integration in education should be understood as a process involving organisational, professional, and technological dimensions rather than as a purely technological development. Kalogeratos et al. (2026) similarly highlighted the relationship among leadership, teachers' competence, and AI integration, while Zeng et al. (2025) demonstrated the importance of leadership support, resources, training, and collaboration in teachers' AI-related practices.

Despite growing global and national attention to AI in education, limited empirical evidence exists on the relationships among school leadership practices, teachers' digital competence, and AI integration specifically in Civic Education classrooms in Zamfara State. Existing studies have largely focused on higher education, general technology adoption, Social Studies, or other geographical contexts. Consequently, it remains unclear whether school leadership practices and teachers' digital competence are significantly related to AI integration among Civic Education teachers in public secondary schools in Zamfara State. This gap is important because contextual conditions such as infrastructure, professional development opportunities, leadership support, and teachers' digital competence may influence the extent to which AI can be meaningfully incorporated into classroom practice.

### **Statement of the Problem**

Artificial intelligence (AI) is increasingly becoming an important tool for improving teaching, learning, assessment, and instructional planning. However, effective integration of AI in schools depends largely on teachers' digital competence and the support provided through school leadership practices. Despite the growing global and national interest in AI, evidence suggests that many schools, particularly in developing educational contexts, continue to experience challenges relating to inadequate digital infrastructure, limited professional development, insufficient AI-related knowledge, and weak institutional support (Akinola et al., 2026; Oyefeso et al., 2025). In Civic Education classrooms, the effective use of AI requires teachers to possess adequate digital competence and the ability to evaluate and apply AI tools meaningfully, critically, ethically, and responsibly. However, existing Nigerian studies have reported varying levels of AI adoption and have identified teachers' technological competence as an important factor associated with technology and AI integration (Eguagie, 2025; Onyepke et al., 2025). School leadership may also play an important role by providing resources, training opportunities, technical support, and a supportive environment for teachers' use of emerging technologies.

Against this background, the present study examined the relationships among school leadership practices, teachers' digital competence, and AI integration in Civic Education classrooms in Zamfara State, Nigeria. Specifically, the study examined the relationship between school leadership practices and AI integration, the relationship between teachers' digital competence and AI integration, and the combined contribution of school leadership practices and teachers' digital competence to AI integration. The study was intended to provide context-specific empirical evidence that may assist educational administrators, school leaders, Civic Education teachers, teacher educators, and policymakers in strengthening professional development, digital infrastructure, leadership support, and responsible AI integration in Civic Education classrooms.

### **Theoretical Framework**

This study is anchored on the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003). The theory explains

individuals' acceptance and use of new technologies through key factors such as performance expectancy, effort expectancy, social influence, and facilitating conditions. According to the theory, individuals are more likely to adopt and use a technology when they believe that it will improve their performance, is easy to use, receives social and organisational support, and is supported by adequate facilities and resources. The theory is relevant to the present study because the integration of artificial intelligence (AI) in Social Studies classrooms may depend on both teachers' personal capabilities and the conditions provided by the school. Muhammad and Na'ala (2026) stated that, teachers' digital competence can influence their confidence and ability to understand and use AI tools effectively, thereby reducing the difficulty associated with technology adoption. Similarly, school leadership practices can provide facilitating conditions through the provision of digital resources, professional development, technical support, and policies that encourage innovation. When teachers possess adequate digital competence and receive strong leadership support, they may be more willing and able to integrate AI into classroom instruction.

Therefore, the UTAUT provides a useful explanation for the relationships among school leadership practices, teachers' digital competence, and AI integration in Social Studies classrooms in Zamfara State. The theory assumes that effective AI integration is not determined by teachers' willingness alone but is influenced by their competence, perceptions of the usefulness of AI, and the organisational support available within their schools. Thus, the UTAUT provides an appropriate theoretical foundation for examining how school leadership practices and teachers' digital competence are related to AI integration in Social Studies classrooms.

### **Research Objectives**

The main objective of the study was to examine the relationships among school leadership practices, teachers' digital competence, and AI integration in Civic Education classrooms in Zamfara State, Nigeria.

Specifically, the study sought to:

1. Determine the relationship between school leadership practices and AI integration in Civic Education classrooms in Zamfara State, Nigeria.
2. Examine the relationship between teachers' digital competence and AI integration in Civic Education classrooms in Zamfara State, Nigeria.
3. Determine the combined contribution of school leadership practices and teachers' digital competence to AI integration in Civic Education classrooms in Zamfara State, Nigeria.

### **Research Questions**

1. What relationship exists between school leadership practices and AI integration in Civic Education classrooms in Zamfara State, Nigeria?
2. What relationship exists between teachers' digital competence and AI integration in Civic Education classrooms in Zamfara State, Nigeria?
3. What is the combined contribution of school leadership practices and teachers' digital competence to AI integration in Civic Education classrooms in Zamfara State, Nigeria?

## Research Hypotheses

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

1.  $H_{01}$ : There is no significant relationship between school leadership practices and AI integration in Civic Education classrooms in Zamfara State, Nigeria.
2.  $H_{02}$ : There is no significant relationship between teachers' digital competence and AI integration in Civic Education classrooms in Zamfara State, Nigeria.
3.  $H_{03}$ : School leadership practices and teachers' digital competence do not make a significant combined contribution to AI integration in Civic Education classrooms in Zamfara State, Nigeria.

## Research Methodology

The study adopted a quantitative correlational survey research design because it involved the collection and analysis of numerical data to determine the relationships among school leadership practices, teachers' digital competence, and artificial intelligence (AI) integration in Civic Education classrooms in Zamfara State, Nigeria. The correlational design was appropriate because the study examined the statistical relationships among the variables without manipulating them. The population comprised Civic Education teachers in public secondary schools in Zamfara State. A sample of 384 teachers was selected through a multistage sampling procedure. The sampling process involved grouping schools according to their educational zones, selecting schools from the identified zones, and subsequently selecting Civic Education teachers from the sampled schools using proportionate and simple random sampling procedures. The final manuscript should state the exact population figure and sampling-frame source used to obtain the 384 respondents.

Primary data were collected using a researcher-developed School Leadership, Teachers' Digital Competence, and AI Integration Questionnaire (SLTDCAIQ). The questionnaire was developed from the study objectives, relevant literature, and the Unified Theory of Acceptance and Use of Technology (UTAUT). It consisted of sections measuring school leadership practices, teachers' digital competence, and AI integration in Civic Education classrooms. Items were structured on a four-point Likert scale ranging from Strongly Agree to Strongly Disagree. Secondary sources included relevant peer-reviewed journal articles, books, official educational documents, policy documents, and other credible scholarly materials, which were used to provide the conceptual, theoretical, and empirical foundations of the study.

The instrument was subjected to expert validation by specialists in Educational Foundations, Civic Education, Educational Technology, and Measurement and Evaluation to establish its relevance, clarity, coverage, and alignment with the study objectives. A pilot test was conducted among Civic Education teachers who were not included in the main study. The internal consistency of the instrument was established using Cronbach's alpha, which yielded an overall reliability coefficient of 0.86, indicating satisfactory reliability. For stronger reporting, the reliability coefficients for each major subscale should also be included if they are available.

Data were collected after obtaining the necessary permission from relevant educational authorities and school administrators. The purpose of the study was

explained to the respondents, participation was voluntary, and confidentiality of the information provided was maintained. The completed questionnaires were screened, coded, and analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarise the data. Pearson Product–Moment Correlation was used to test the first and second null hypotheses concerning the relationships between school leadership practices and AI integration, and between teachers' digital competence and AI integration, respectively. Multiple regression analysis was used to test the third hypothesis concerning the combined contribution of school leadership practices and teachers' digital competence to AI integration. The analysis produced regression coefficients, standard errors, standardised beta coefficients, t-values, and significance values; the complete regression model should also report R,  $R^2$ , adjusted  $R^2$ , F-value, and model significance from the SPSS output.

The hypotheses were tested at the 0.05 level of significance. A null hypothesis was rejected when the obtained p-value was less than 0.05 and retained when the p-value was greater than 0.05. The findings were interpreted in relation to the research objectives, previous empirical studies, and the UTAUT. Because the study employed a correlational design, conclusions were expressed in terms of statistical relationships and contributions rather than causal effects. Ethical principles, including voluntary participation, confidentiality, informed participation, and responsible use of research data, were observed throughout the study.

### Hypothesis One

**H<sub>01</sub>:** There is no significant relationship between school leadership practices and AI integration in Civic Education classrooms in Zamfara State, Nigeria.

**Table 1:** Pearson Product–Moment Correlation between School Leadership Practices and AI Integration in Civic Education Classrooms

| Variable                    | N   | r-value | p-value  | Decision               |
|-----------------------------|-----|---------|----------|------------------------|
| School leadership practices | 384 |         |          |                        |
| AI integration              | 384 | .612**  | p < .001 | Reject H <sub>01</sub> |

Table 4.1 shows a statistically significant positive relationship between school leadership practices and AI integration in Civic Education classrooms,  $r(382) = .612$ ,  $p < .001$ . The result indicates that improved school leadership practices were associated with higher levels of AI integration in Civic Education classrooms. Therefore, the null hypothesis was rejected. The strength of the relationship was moderate to strong, suggesting that school leadership practices are an important factor associated with successful AI integration.

### Hypothesis Two

**H<sub>02</sub>:** There is no significant relationship between teachers' digital competence and AI integration in Civic Education classrooms in Zamfara State, Nigeria.

**Table 4.2** Pearson Product–Moment Correlation between Teachers' Digital Competence and AI Integration in Civic Education Classrooms

| Variable                     | N   | r-value | p-value    | Decision        |
|------------------------------|-----|---------|------------|-----------------|
| Teachers' digital competence | 384 |         |            |                 |
| AI integration               | 384 | .684**  | $p < .001$ | Reject $H_{02}$ |

Table 4.2 reveals a statistically significant positive relationship between teachers' digital competence and AI integration in Civic Education classrooms,  $r(382) = .684$ ,  $p < .001$ . This implies that teachers with higher levels of digital competence were more likely to integrate AI tools and technologies into Civic Education teaching and learning. Consequently, the null hypothesis was rejected. The result demonstrates a strong positive association between teachers' digital competence and AI integration.

### Hypothesis Three

$H_{03}$ : There is no significant relationship among school leadership practices, teachers' digital competence, and AI integration in Civic Education classrooms in Zamfara State, Nigeria.

**Table 4.3** Multiple Regression Analysis on School Leadership Practices, Teachers' Digital Competence, and AI Integration in Civic Education Classrooms

| Predictor Variable           | B     | SEB   | $\beta$ | t     | P-value    |
|------------------------------|-------|-------|---------|-------|------------|
| Constant                     | 0.842 | 0.169 | -       | 4.98  | $p < .001$ |
| School leadership practices  | 0.286 | 0.046 | .302    | 6.22  | $p < .001$ |
| Teachers' digital competence | 0.511 | 0.047 | .526    | 10.87 | $p < .001$ |

The results in Table 4.3 indicate that school leadership practices and teachers' digital competence have significant positive relationships with AI integration in Civic Education classrooms in Zamfara State, Nigeria. School leadership practices significantly contributed to AI integration ( $\beta = .302$ ,  $t = 6.22$ ,  $p < .001$ ), while teachers' digital competence also made a stronger significant contribution ( $\beta = .526$ ,  $t = 10.87$ ,  $p < .001$ ). This shows that teachers' digital competence was the stronger predictor of AI integration. Therefore, the null hypothesis ( $H_{03}$ ), which states that there is no significant relationship among school leadership practices, teachers' digital competence, and AI integration in Civic Education classrooms, was rejected. The findings imply that effective school leadership and improved teachers' digital competence are associated with higher levels of AI integration in Civic Education classrooms.

### Discussion of findings

The findings of the study showed a significant positive relationship between school leadership practices and AI integration in Civic Education classrooms in Zamfara State,  $r(382) = .612$ ,  $p < .001$ . Therefore, the first null hypothesis was rejected. This means that schools with effective leadership practices were more likely to have higher levels of AI integration in Civic Education classrooms. The finding suggests

that school leaders have an important role in encouraging teachers to adopt new technologies by providing direction, support, training opportunities, and a favourable environment. This finding agrees with Zeng et al. (2025), who reported that digital leadership influences teachers' readiness to integrate AI into teaching. It is also in line with Awodiji and Adeoye (2026), who identified leadership support, professional development, infrastructure, and institutional readiness as important factors for AI adoption in Nigerian schools. Similarly, Chiu et al. (2024) found that support from the school environment contributes to teachers' digital competence and technology integration.

The findings also revealed a significant positive relationship between teachers' digital competence and AI integration in Civic Education classrooms,  $r(382) = .684$ ,  $p < .001$ . Consequently, the second null hypothesis was rejected. This indicates that teachers with better digital knowledge and skills were more likely to use AI tools in their teaching. This is understandable because teachers need adequate digital competence to select, operate, and apply AI tools effectively and responsibly in the classroom. The finding supports Ayanwale et al. (2024), who found that teachers' technological competence and self-efficacy are important for their preparedness to integrate AI. It also agrees with Kong et al. (2024) and Collie et al. (2024), who reported that teachers' competence, confidence, and self-efficacy influence their adoption of generative AI. In addition, Fütterer et al. (2024) and Daher (2025) stressed the importance of AI literacy, including technical, pedagogical, and ethical knowledge, for teachers' effective use of AI in education.

The regression analysis further showed that both school leadership practices and teachers' digital competence were significantly related to AI integration in Civic Education classrooms. However, teachers' digital competence made the stronger contribution ( $\beta = .526$ ) compared with school leadership practices ( $\beta = .302$ ). Therefore, the third null hypothesis was rejected. This suggests that although effective leadership provides the necessary support and conditions for AI integration, teachers' own digital competence is especially important because teachers are directly responsible for using AI in classroom teaching and learning. This finding supports the view that successful AI integration requires both institutional support and competent teachers. Lademann et al. (2026) also found that appropriate professional development can improve teachers' AI literacy and attitudes towards AI use.

Overall, the findings suggest that meaningful AI integration in Civic Education classrooms depends on the combined efforts of school leaders and teachers. School leaders need to provide support, training opportunities, infrastructure, and clear guidance, while teachers need to continuously improve their digital and AI-related skills. Therefore, strengthening both leadership practices and teachers' digital competence may enhance the effective and responsible integration of AI in Civic Education classrooms in Zamfara State. The findings are supported by Awodiji and Adeoye (2026), Zeng et al. (2025), Chiu et al. (2024), Ayanwale et al. (2024), Kong et al. (2024), Collie et al. (2024), Fütterer et al. (2024), Daher (2025), Lademann et al. (2026), and recent research on teachers' preparedness for generative AI integration in K-12 education.

## CONCLUSION

The study concluded that school leadership practices and teachers' digital competence are significantly associated with AI integration in Civic Education classrooms in Zamfara State, Nigeria. While effective school leadership provides the institutional support, direction, and enabling environment required for AI adoption, teachers' digital competence has a stronger association with the actual integration of AI in classroom practice. Therefore, improving both leadership practices and teachers' digital and AI-related skills is essential for meaningful, effective, and responsible AI integration in Civic Education classrooms.

## Recommendations

1. School administrators should provide regular training and professional development programmes on AI and its effective application in Civic Education classrooms.
2. Educational authorities should provide adequate digital infrastructure, including internet facilities, computers, and other relevant technologies, to support AI integration in schools.
3. School leaders should develop clear policies and guidelines that encourage the responsible and ethical use of AI in teaching and learning.
4. Teachers should be encouraged to continuously improve their digital competence and AI literacy through workshops, seminars, conferences, and self-directed learning.
5. Government and other educational stakeholders should support schools with the necessary financial and technical resources to promote the sustainable integration of AI in Civic Education classrooms.

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