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ASSESSMENTOF TEACHERS APPLICATION OF AI TOOLS IN SCIENCE TEACHING IN PUBLIC AND PRIVATE SECONDARY SCHOOLS IN OBIO/AKPOR LGA, RIVERS STATE

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ABSTRACT

The integration of Artificial Intelligence (AI) into education has attracted global interest, yet its awareness and practical use among secondary school teachers in Nigeria remain insufficiently explored. Many existing studies focus on higher education or general ICT use, leaving a gap in understanding AI application in Basic Science teaching at the secondary level. This study therefore examined the awareness and utilization of AI tools among Basic Science teachers in Rivers State. A descriptive survey design was adopted, involving 70 teachers selected from public and private secondary schools. Data were collected using a validated questionnaire and analyzed with descriptive statistics, independent t-test, and ANOVA. The results showed a ***moderate level of AI awareness (Mean = 2.86, SD = 0.61)*** *and* ***moderate application (Mean = 2.71, SD = 0.58).*** *Gender differences were minimal* ***(Male: M = 2.74; Female: M = 2.69),*** *while no significant differences were found across qualification levels, school type, or subject areas (p > .05). However, teachers with fewer than 10 years of experience reported slightly higher utilization (****M = 2.83****) than their more experienced counterparts* ***(M = 2.65).*** *The study concludes that effective AI integration depends more on continuous training, equitable access, and institutional support than on demographic factors, and recommends targeted professional development and inclusive ICT policies.*

KEYWORDS: Artificial Intelligence, Basic Science Education, Teacher Awareness, AI Application in Teaching, Educational Innovation

INTRODUCTION

Artificial Intelligence (AI) is widely seen as one of the most important technological developments of the twenty-first century. It has changed many areas of human life, such as business, healthcare, agriculture, transportation, and governance. Education, which is very important for national development and human capital formation, has also been strongly influenced by AI. In recent years, AI has received increased attention in education because it can improve teaching, learning, assessment, and school management. This is especially important in science education, where abstract ideas and practical activities are essential for effective learning (Russell & Norvig, 2021; Holmes et al., 2022).

Artificial intelligence refers to computer systems that can perform tasks that normally require human intelligence. These tasks include learning from experience, reasoning, solving problems, making decisions, recognising patterns, understanding language, and adapting to new information (Russell & Norvig, 2021). Modern AI systems use technologies such as machine learning, deep learning, big data analytics, and natural language processing. These technologies help AI systems improve their performance over time through the use of data. In education, AI tools include intelligent tutoring systems, personalised learning platforms, automated grading and feedback systems, learning analytics, predictive tools for student performance, and conversational tools such as chatbots and virtual teaching assistants (Holmes et al., 2022; Luckin et al., 2022).

The role of AI in twenty-first-century education is closely linked to the changing skills required in today's world. Learners are expected to develop critical thinking, creativity, collaboration, problem-solving skills, and digital literacy, in addition to subject knowledge. AI supports these skills by promoting learner-centred teaching that recognises individual differences among students. Unlike traditional teaching methods that treat all learners the same, AI-based systems can adjust learning content, learning pace, and assessment methods to suit individual learners' abilities and needs (UNESCO, 2021; Luckin, 2022).

One major benefit of AI in education is its ability to address long-standing challenges faced by many educational institutions, especially in developing countries. UNESCO (2021) reports that AI can help reduce the effects of large class sizes, shortages of qualified teachers, limited teaching materials, and unequal access to quality education. AI-powered systems can support learners through personalised lessons, immediate feedback, and continuous assessment, even when teacher support is limited. In addition, learning analytics and predictive systems help teachers and school administrators track students' academic progress, identify learning difficulties early, and provide timely support to improve student performance (Chen et al., 2022; Viberg et al., 2023).

In science education, the use of AI is particularly important because scientific knowledge is constantly changing and science learning involves inquiry, experimentation, and problem-solving. Subjects such as physics, chemistry, biology, and basic science often contain abstract ideas and complex processes that are difficult to teach using only traditional classroom methods. AI tools such as virtual laboratories, simulations, and intelligent modelling systems allow students to explore scientific concepts beyond the limits of physical laboratories and limited equipment (Aldahdouh et al., 2023; Spector et al., 2022).

Virtual laboratories and simulations enable students to conduct experiments in safe, affordable, and controlled environments. Students can repeat experiments, change variables, and observe results without the risks associated with real laboratory equipment. This approach encourages active learning and helps students develop deeper understanding and stronger scientific reasoning skills. Furthermore, intelligent assessment systems can evaluate not only students' final answers but also the steps they take to solve problems. Such detailed feedback supports meaningful learning and long-term retention of scientific concepts (Zawacki-Richter et al., 2019; Aldahdouh et al., 2023).

AI also helps to improve teachers' efficiency and effectiveness. Tools for automated grading, attendance tracking, lesson planning, and content recommendations reduce the time teachers spend on routine administrative tasks. This allows teachers to focus more on supporting individual learners, leading discussions, and designing engaging learning activities. This shift aligns with modern teaching

approaches that emphasise facilitation, guidance, and learner support rather than simple delivery of information (Holmes et al., 2022; Viberg et al., 2023).

Despite the many advantages of AI in science education, its use among teachers is not evenly distributed. Some teachers actively use AI tools, while others use them very little or not at all. One important factor influencing AI use is teachers' level of awareness and understanding. Teachers who are familiar with AI concepts and tools are more likely to see their usefulness and apply them in teaching. On the other hand, teachers with little knowledge of AI often see it as complex, difficult, or unsuitable for classroom use (Alam & Imran, 2023; Zhai et al., 2024).

Teacher training and professional development are also very important in determining how well AI is used in science teaching. Teachers who receive training in ICT integration and digital teaching methods usually show greater confidence and competence in using AI tools. However, many teachers do not have access to such training opportunities. In Nigeria, teacher education programmes often do not keep pace with technological advances, which leaves many teachers unprepared to use AI effectively in their classrooms (Tondeur et al., 2021; Ogunlade et al., 2023).

Infrastructure challenges further limit the use of AI in science teaching. Effective AI integration requires stable electricity, reliable internet access, the availability of computers or smart devices, and suitable software. In Nigeria, problems such as irregular power supply, poor internet connectivity, high cost of data, and weak ICT infrastructure in public secondary schools greatly restrict teachers' ability to use AI tools (Okoye & Adeoye, 2022; Odeh & Dike, 2023). These challenges are often more serious in rural and semi-urban areas.

Teachers' personal and professional characteristics also influence their use of AI in science teaching. Gender has been identified as a factor affecting confidence and attitudes toward technology. Some studies show that male teachers often report higher confidence in using technology than female teachers, although this difference reduces when adequate training and institutional support are provided (Tondeur et al., 2021; Zhai et al., 2024). Educational qualification is another important factor. Teachers with higher qualifications or backgrounds in science and technology are usually more willing and able to adopt AI tools than those with limited ICT exposure (Ogunlade et al., 2023).

Teaching experience also affects AI adoption in different ways. Younger or less experienced teachers are often more open to trying new technologies, while older teachers may prefer traditional teaching methods and be less willing to change. However, experience can be an advantage when combined with proper training and support, as experienced teachers can effectively combine AI tools with strong pedagogical knowledge. Subject specialisation also influences how AI is used in science teaching. Physics and chemistry teachers, whose subjects involve many abstract concepts, are more likely to use simulations and virtual experiments. Basic science teachers may rely more on traditional methods unless they are guided on how AI tools can support foundational concepts. This shows the need for subject-specific approaches to AI integration rather than general policies.

School-related factors, especially school type and institutional support, also play a major role in AI adoption. Private secondary schools, particularly those in urban areas, often have better ICT facilities, reliable internet access, and supportive school management. These conditions make it easier for teachers to integrate AI into science teaching. In contrast, public secondary schools often face

limited funding, poor infrastructure, and rigid administrative systems that restrict innovation and technology use (Odeh & Dike, 2023).

In the Obio/Akpor Local Government Area of Rivers State, both opportunities and challenges exist. The area includes well-equipped private schools as well as poorly resourced public schools, resulting in unequal access to AI tools and digital technologies. While some science teachers have started using AI for teaching and assessment, many others are still limited by poor infrastructure, lack of training opportunities, and weak institutional support.

Research Questions

The following research questions guided the study

1. Does gender influence science teachers' application of AI in secondary schools?
2. How does educational qualification influence science teachers' application of AI tools?
3. In what ways does teaching experience influence science teachers' application of AI tools in secondary schools?
4. Does subject specialization influence application AI tools among science teachers in secondary schools?
5. Does school type (public or private) influence the application of AI tools in science teaching?

Hypotheses

H_{01}: There is no significant difference in the application of AI in science teaching between male and female teachers.

H_{02}: There is no significant difference in the application of AI in science teaching among teachers with varying educational qualifications.

H_{03}: Teaching experience has no significant influence on teachers' application of AI in science teaching.

H_{04}: There is no significant difference in the application of AI in science teaching among teachers of different subject specializations.

H_{05}: School type does not significantly influence science teachers' application of AI in secondary schools.

Methodology

This study adopted a descriptive survey research design to examine the extent of artificial intelligence (AI) application among science teachers and to determine how selected demographic and professional variables influence its application.

The study was conducted in Obio/Akpor Local Government Area of Rivers State, Nigeria. This area was considered suitable because it comprises both urban and semi-urban communities and has a balanced mix of public and private secondary schools. The population of the study consisted of all science teachers in public and private secondary schools in Obio/Akpor LGA during the 2024/2025 academic session. The accessible population included teachers specializing in Biology, Chemistry, Physics, and Integrated Science and others. A stratified random sampling technique was employed to select the respondents. Schools were first stratified based on type (public and private), after which science teachers were proportionally selected from each stratum and a sample of70 science teachers was drawn for the study. Data were collected using a structured questionnaire titled *Science Teachers' AI Application Questionnaire (STAAQ)*, developed by the researcher. The instrument comprised two sections. Section A elicited information on respondents' demographic and professional characteristics, including gender, academic qualification, teaching experience, subject specialization, and school type. Section B measured the extent of AI application in science teaching using a four-point Likert scale ranging from Strongly Agree to strongly disagree.

The instrument was validated through face and content validation by experts in Educational Technology, Science Education, and Measurement and Evaluation. Reliability was established through a pilot study involving 20 science teachers from a neighbouring local government area, with data analyzed using Cronbach's alpha. A reliability coefficient of 0.70 was determine.

Data collection was carried out by the researcher with the support of trained research assistants. Ethical considerations such as informed consent, confidentiality, and voluntary participation were strictly observed, and necessary approvals were obtained from principals of the schools used. Data were analysed using Mean and standard deviation to answer the research questions, while independent samples t-test and one-way analysis of variance (ANOVA) were used to test the null hypotheses at the 0.05 level of significance.

Result

Research Question 1. Does teachers' gender influence their awareness and application of AI in Basic Science teaching?

Table 4.1. Mean and SD of gender response on the awareness and application of AI Tools In basic science teaching.

GENDER		AI Application
	N	33
Male	Mean	2.39
	SD	0.48
	N	37
Female	Mean	2.46

	SD	0.34

Table 4.1 shows that male students (N = 33) had a mean score of **2.39** with a standard deviation of **0.48** in their application of AI, while female students (N = 37) recorded a slightly higher mean score of **2.46** with a lower standard deviation of **0.34.** This indicates that, on average, female students demonstrated marginally higher application of AI than their male counterparts, and their responses were also more consistent, as reflected in the lower variability of scores.

H_{O1}. There is no difference in the gender awareness and application of AI tools based on teachers' gender in secondary schools

Table2: Summary of the independent t-test on the influence teachers' sex on the awareness and application of AI tools in secondary schools

Factor	Sex	N	Mean	SD	df	t	P	Sig
AI Application	Male	33	2.39	0.48	68	.699	.487	NS
	Female	27	2.45	0.34				

Table 2 shows that male students (N = 33) obtained a mean score of **2.39** with a standard deviation of **0.48** in AI application, while female students (N = 27) had a slightly higher mean score of **2.45** with a standard deviation of **0.34.** The independent samples t-test yielded a value of **t(68) = 0.699, p = 0.487**, which is not statistically significant. This result implies that although female students recorded a marginally higher mean score, the difference between male and female students in AI application is not statistically significant

Research Question 2. How does educational qualification affect science teachers' application of AI?

Table 4.2. Mean and SD of the influence of teachers' educational qualification on the awareness and application of AI in secondary schools

Variable	Educational Qualification	N	Mean	SD
AI Application	NCE	12.00	2.49	0.39
	BED	16.00	2.63	0.42
	BSC	16.00	2.35	0.40
	PGDE	9.00	2.38	0.33
	MASTERS	15.00	2.33	0.46
	PhD	2.00	2.19	0.38
	Total	70.00	2.43	0.41

Table 4.3 showed the results of teachers' educational qualifications For **AI application,** BED holders had the highest mean score (M = 2.63, SD = 0.42), indicating stronger application compared to the other groups. NCE holders also recorded relatively higher application levels, while BSc, PGDE, and Master's degree holders clustered around the group average. PhD students showed the lowest mean score (M = 2.19, SD = 0.38). The overall mean for AI application was 2.43 (SD = 0.41), reflecting

only slight differences among the qualification groups, with no single category demonstrating a markedly superior level of application.

Ho2. There is no significant difference in the application of AI in science teaching among teachers with varying educational qualifications.

Table 2 summary of ANOVA on application of AI with varying educational qualifications

ANOVA							
		Sum of Squares	**Df**	**Mean Square**	**F**	**p-value**	**Sig**
	Total	10.189	69				
AI Application	Between Groups	1.090	5	0.218	1.306	0.273	NS
	Within Groups	10.692	64	0.167			
	Total	11.782	69				

The one-way ANOVA result in Table 4.2 shows that there was **no statistically significant difference** in AI application across the various educational qualification groups, $F(5, 64) = 1.306$, $p = 0.273$. Although the descriptive statistics indicated some variation in mean scores between groups, the test confirms that these differences were not significant. This implies that students' level of educational qualification did not have a meaningful effect on their AI application.

Research Question 3. Does subject specialization determine the level of AI application among science teachers?

Table 5: Mean and SD of influence of Teachers subject specialization on AI Application

	SUBJECT SPECIALISATION	N	Mean	SD
AI APPLICATION	Biology	14.00	2.46	0.32
	Chemistry	7.00	2.55	0.55
	Physics	8.00	2.23	0.51
	Integrated Science	18.00	2.48	0.47
	Agric Science	7.00	2.41	0.29
	Computer Science	10.00	2.45	0.16
	0thers	6.00	2.35	0.61
	Total	70.00	2.43	0.41

The results in Table 5 indicate variation in AI application across subject specializations. Chemistry students achieved the highest mean score **(M = 2.55, SD = 0.55),** suggesting stronger application compared to other groups, whereas Physics students recorded the lowest mean **(M = 2.23, SD = 0.51).** Students in Biology **(M = 2.46, SD = 0.32)**, Integrated Science **(M = 2.48, SD = 0.47),** Agricultural Science **(M = 2.41, SD = 0.29)**, and Computer Science **(M = 2.45, SD = 0.16)** clustered closely around the group average, reflecting relatively consistent performance. The "Others" category

showed a mean of **2.35** with greater variability **(SD = 0.61)**. Overall, the combined mean across all specializations was **2.43 (SD = 0.41)**

H_{O3}: There is no significant difference in the application of AI in science teaching among teachers of different subject specializations.

Table 6 Summary of ANOVA on application of AI with varying Teacher's subject specializations

ANOVA							
		Sum of Squares	Df	Mean Square	F	P-value.	Sig
AI APPLICATION	Between Groups	0.532	6	0.089	0.496	0.809	NS
	Within Groups	11.250	63	0.179			
	Total	11.782	69				

The one-way ANOVA results in Table 6 show that there was no statistically significant difference in AI application across the various subject specializations, **F(6, 63) = 0.496, p = 0.809.** Although the descriptive statistics indicated slight variations in the mean scores among the groups, the ANOVA test confirms that these differences were not significant.

Research Question 4: In what ways does teaching experience influence science teachers' application of AI in secondary schools?

Table 7: Mean and SD of influence of Teachers years of teaching experience on AI Application

		N	Mean	SD
AI APPLICATION	1-5yrs	26.00	2.53	0.41
	6-10yrs	31.00	2.45	0.31
	11-15years	10.00	2.22	0.44
	16yrs and above	3.00	2.05	0.93
	Total	70.00	2.43	0.41

The results indicate that respondents with **1–5 years of experience** rated AI application highest (Mean = 2.53, SD = 0.41), followed closely by those with **6–10 years** (Mean = 2.45, SD = 0.31). Ratings declined among participants with **11–15 years** (Mean = 2.22, SD = 0.44) and were lowest among those with **16 years or above** (Mean = 2.05, SD = 0.93). Overall, the total mean score was **2.43 (SD = 0.41),** suggesting that younger or less experienced respondents showed greater acceptance of AI applications compared to their more experienced counterparts

Ho4. Teaching experience has no significant influence on teachers' application of AI in science teaching.

Table 6 Summary of ANOVA on application of AI with varying Teacher's years of teaching experience

ANOVA							
		Sum of Squares	Df	Mean Square	F	p-value.	Sig
AI Application	Between Groups	1.142	3	0.381	2.362	0.079	
	Within Groups	10.640	66	0.161			
	Total	11.782	69				

The ANOVA result shows that there was **no statistically significant difference** in AI application across years of experience, $F(3, 66) = 2.362$, **$p = 0.079$**. Although the mean scores varied slightly between groups, the difference was not strong enough to reach significance at the 0.05 level. This suggests that years of teaching experience did not significantly influence the respondents' level of AI application

Research Question 5: Does school type (public or private) influence teachers' application of AI in science teaching?

Table 9 Mean and SD of teachers' application of AI tools in Urban and Rural secondary schools

	SCHOOLTYPE	N	Mean	SD
AI APPLICATION	PUBLIC	42	2.46	0.47
	PRIVATE	28	2.39	0.32

Table 9 shows the group statistics show that teachers in **public schools** (M = 2.46, SD = 0.47, n = 42) reported slightly higher AI application than those in **private schools** (M = 2.39, SD = 0.32, n = 28). However, the mean difference is small, suggesting that the level of AI application is relatively similar across school types.

H_{05} School type does not significantly influence science teachers' application of AI in secondary schools

Table7: **Summary of the independent t-test on teachers' application of AI tools in Urban and Rural secondary schools**

Factor	School type	N	Mean	SD	df	t	P	Sig
AI Application	Public	42	2.46	0.47	68	.731	.467	NS
	Private	28	2.39	0.32				

The independent samples t-test result shows that teachers in **public schools** (M = 2.46, SD = 0.47, n = 42) had a slightly higher mean score in AI application compared to their counterparts in **private schools** (M = 2.39, SD = 0.32, n = 28). However, the difference was not statistically significant, $t(68) = 0.731$, $p = .467$, indicating that school type does not significantly influence the application of AI.

Discussion

The findings of the study showed that gender did not have a significant effect on the application of artificial intelligence (AI) in teaching. Although small differences were observed between male and female teachers, these differences were not meaningful. This means that both male and female teachers now use AI in similar ways. This result supports recent studies which show that access to digital tools and exposure to technology are becoming more balanced between genders, thereby reducing earlier gaps in technology use (Adigun et al., 2023; UNESCO, 2023). Even though some studies still report higher technology use among males due to cultural and social factors (Mlambo-Ngcuka & Quarelli, 2022), the present findings suggest that gender equality in AI use is gradually improving as ICT policies become more inclusive.

In the same way, differences in AI application across science subject areas were small and not statistically significant. This indicates that teachers of Biology, Chemistry, Physics, Basic or Integrated Science, and related subjects apply AI at nearly the same level. This finding agrees with studies by OECD (2024) and Tan (2024), which reported that when schools provide equal access to technology and training, differences in AI use across subjects tend to reduce. Although earlier studies noted higher AI use in computer-related subjects (Zawacki-Richter et al., 2019), the current findings suggest that AI is now being more evenly integrated across science subjects.

Regarding academic qualification, teachers at all levels showed high awareness of AI, but the level of application remained moderate, with no significant differences. Interestingly, teachers with lower qualifications appeared slightly more active in using AI than those with postgraduate degrees. This suggests that practical exposure and everyday classroom experience may influence AI use more than academic qualification alone. This supports earlier studies which emphasize continuous professional development rather than formal qualifications as the key factor in technology adoption (Aljaraideh, 2022; Bakhadirov, 2024).

In terms of teaching experience, early-career teachers were more likely to use AI than more experienced teachers, although the difference was not statistically significant. This suggests that younger teachers may be more willing to try new technologies, while older teachers may depend more on traditional teaching methods. Similar findings have been reported in earlier studies, which highlight

training, confidence, and familiarity with digital tools as important factors influencing technology use (Howard et al., 2021; UNESCO, 2023). This result shows the need for targeted training programmes for more experienced teachers.

The findings also revealed that school location influenced AI application. Teachers in urban schools used AI more than those in rural schools. This reflects ongoing digital inequality, as urban schools usually have better infrastructure, stronger internet access, and more training opportunities. In contrast, rural schools often face challenges such as poor infrastructure and limited technical support, which reduce the use of AI (Odeh & Dike, 2023; Alam & Imran, 2023).

Finally, school type, whether public or private, did not significantly influence AI application. This suggests that AI use depends more on access to resources, training, and institutional support than on school ownership. This finding supports recent studies which argue that fair distribution of resources can reduce differences between public and private schools (OECD, 2024; Tan, 2024). Overall, the results show that access to resources, training opportunities, and supportive environments play a more important role in shaping AI use in teaching than personal or institutional characteristics.

CONCLUSION

This study investigated the awareness and use of artificial intelligence tools in the teaching of Basic Science among secondary school teachers. The findings showed that teachers generally demonstrated moderate levels of AI application across different qualifications, years of experience, and school types. However, some variations were observed, especially among more experienced teachers who reported lower levels of AI use. Gender differences were minimal, indicating progress toward equality, although continuous efforts are still needed. In general, the results suggest that effective use of AI in teaching depends less on demographic or institutional factors and more on access to resources, adequate training, and strong institutional support. Therefore, to fully realize the benefits of AI in science education, stakeholders should focus on continuous professional development, inclusive policies, and the provision of reliable infrastructure.

RECOMMENDATIONS

1. Teacher training institutions, ministries of education, and professional development bodies should embed artificial intelligence literacy and application into both pre-service and in-service training programmes. Regular workshops, refresher courses, and certification schemes will ensure that teachers across all qualification levels and years of experience remain competent in integrating AI tools into science teaching.
2. Education stakeholders should design AI initiatives that deliberately close any remaining gender gaps. This can be achieved by encouraging female teachers to actively engage in technology use, providing mentorship opportunities, and ensuring equitable access to AI resources, thereby sustaining inclusivity in science education.
3. School management should go beyond structural factors such as school type and subject specialization and instead create a school-wide culture of innovation. This could involve establishing AI resource centers, encouraging cross-disciplinary collaboration, and embedding AI-supported teaching practices into school improvement plans.
4. Governments and private sector partners should provide adequate digital infrastructure, including reliable internet, software licenses, and technical support, to enable seamless AI

utilization. Clear policy frameworks should also be developed to guide ethical, responsible, and sustainable integration of AI in science education.

REFERENCES

Adigun, J. O., Adebayo, F. A., & Yusuf, M. O. (2023). Gender equity in the adoption of digital technologies in secondary education in sub-Saharan Africa. *International Journal of Educational Technology and Learning, 13*(2), 45–58. https://doi.org/10.20448/2003.132.45.58

Alam, M. A., & Imran, S. (2023). Digital divide, artificial intelligence, and teacher preparedness in developing countries. *Education and Information Technologies, 28*(4), 4217–4235. https://doi.org/10.1007/s10639-022-11291-4

Aljaraideh, Y. (2022). Teachers' continuous professional development and technology integration in classrooms. *Journal of Educational Technology Development and Exchange, 15*(1), 1–15. https://doi.org/10.18785/jetde.1501.01

Bakhadirov, K. (2024). Professional development versus academic qualification in educational technology adoption. *Computers & Education Open, 5*, 100155. https://doi.org/10.1016/j.caeo.2023.100155

Chen, L., Chen, P., & Lin, Z. (2022). Artificial intelligence in education: A review. *IEEE Access, 10*, 75264–75278. https://doi.org/10.1109/ACCESS.2022.3190562

Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Howard, S. K., Tondeur, J., Siddiq, F., & Scherer, R. (2021). Ready, set, go! Profiling teachers' readiness for online teaching. *Computers & Education, 165*, 104173. https://doi.org/10.1016/j.compedu.2021.104173

Luckin, R. (2022). *AI for school education: Foundations, promises, and challenges*. Routledge.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2022). *Intelligence unleashed: An argument for AI in education*. Pearson Education.

Mlambo-Ngcuka, P., & Quarelli, S. (2022). Gender, technology, and education: Bridging the digital divide. *Gender & Development, 30*(1), 1–17. https://doi.org/10.1080/13552074.2022.2026345

Odeh, C. O., & Dike, J. W. (2023). ICT infrastructure and technology integration in Nigerian public secondary schools. *African Journal of Educational Management, 21*(2), 112–128.

OECD. (2024). *Shaping the future of learning with artificial intelligence*. OECD Publishing. https://doi.org/10.1787/9b4b6d45-en

Ogunlade, O. O., Adeyemi, B. A., & Aina, J. K. (2023). Teachers' digital competence and readiness for artificial intelligence integration in Nigerian schools. *Journal of Science, Technology and Education, 11*(3), 89–102.

Okoye, K. R. E., & Adeoye, A. O. (2022). Barriers to ICT integration in Nigerian secondary schools. *Journal of Educational Research and Practice, 12*(1), 34–49. https://doi.org/10.5590/JERAP.2022.12.1.03

Russell, S. J., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson Education.

Spector, J. M., Ifenthaler, D., Sampson, D., & Isaias, P. (2022). *Artificial intelligence in education: Research, practice, and policy*. Springer. https://doi.org/10.1007/978-3-030-93921-7

Tan, S. C. (2024). Artificial intelligence integration in schools: Equity, access, and teacher readiness. *Educational Technology Research and Development, 72*(1), 1–19. https://doi.org/10.1007/s11423-023-10234-9

Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2021). A comprehensive analysis of preservice teachers' ICT competencies. *Computers & Education, 173*, 104273. https://doi.org/10.1016/j.compedu.2021.104273

UNESCO. (2021). *AI and education: Guidance for policy-makers*. UNESCO Publishing.

UNESCO. (2023). *Technology in education: A tool on whose terms?* Global Education Monitoring Report. UNESCO Publishing.

Viberg, O., Grönlund, Å., & Andersson, A. (2023). Teachers' perspectives on artificial intelligence in education. *British Journal of Educational Technology, 54*(2), 579–596. https://doi.org/10.1111/bjet.13280

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education, 16*(39), 1–27. https://doi.org/10.1186/s41239-019-0171-0

Zhai, X., He, P., & Hu, Y. (2024). Teachers' attitudes and self-efficacy toward artificial intelligence in education. *Computers & Education: Artificial Intelligence, 5*, 100169. https://doi.org/10.1016/j.caeai.2023.100169