

MATHEMATICS TEACHERS' READINESS FOR THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN TEACHING AND LEARNING MATHEMATICS

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Abstract

This study was conducted to assess teachers' readiness for the applications of artificial intelligence (AI) in teaching. The study adopted a descriptive research design. The study was conducted in Uzo-Uwani L.G.A Enugu State. Four research questions and three hypotheses guided the study. The population comprised 53 teachers in Uzo-Uwani L.G.A, Enugu State, which was manageable for the study. Thus, there was no sampling since the whole population of teachers in the study area participated in the study. Teachers' readiness for the application of AI Questionnaire (TRAAIQ) was used as the instrument for data collection. The reliability estimate of the instrument was determined to be 0.78 with the use of the Cronbach's alpha method after subjecting the instrument to trial testing. Mean and standard deviation were applied to answer the research questions, while ANOVA and independent samples t-test were applied to test the hypotheses at a 0.05 level of significance. The result showed that teachers have a very high level of readiness for the applications of AI. Additionally, it was revealed that experience and qualification significantly influence teachers' level of readiness for the applications of AI in teaching and learning mathematics. Moreover, gender does not significantly influence teachers' level of readiness for the applications of AI in teaching and learning. Based on the findings, it was recommended, among others, that the government should organize seminars for the training of teachers on the application of different AI tools in teaching and learning Mathematics.

Keywords: Mathematics, Achievement, Artificial Intelligence, Readiness.

Introduction

Education in contemporary times is increasingly shaped by digital innovation, and one of the most significant advances influencing teaching and learning is artificial intelligence (AI), particularly in subjects like mathematics that involve critical reasoning. In mathematics education, this development is especially important because mathematics as a subject continues to serve as a foundation for scientific, technological, and economic advancement, yet many learners still struggle to achieve acceptable performance levels.

In Nigeria, the search for improved academic achievement in mathematics has drawn attention to teachers' preparedness for new technologies increasingly necessary which have made teachers to seek for advance technology in enhancing academic achievement in mathematics. . Mathematics has been defined in different ways by scholars, but the common thread is that it is a discipline concerned with patterns, quantity, structure and logical reasoning. Hom (2020) defined mathematics as a science that is concerned with the logic of quantity, arrangement and

shape. However, Benjamine and Pierce (2019) view Mathematics as a science subject which helps individuals to draw relevant conclusions as well as the interpretation of ideas with the use of numbers and symbols. Conceptually, mathematics may also be understood as the language through which relationships among numbers, space, and change are represented and interpreted in a systematic and logical way.

The importance of mathematics goes beyond the periphery of passing examinations. According to Nigerian Educational Research and Development Council (NERDC, 2018), the importance of mathematics includes; develops critical thinking, analytical ability, and problem-solving skills that are needed in science, technology, engineering, business and even everyday decision-making. In the Nigerian context, mathematics is compulsory at the nursery, primary, and secondary levels because it supports progression into many academic and professional fields. This makes mathematics not only a school subject but also a gatekeeper for educational advancement and national productivity. Therefore, it is very important for students to attain high in their academic achievement.

Achievement in mathematics refers to the extent to which learners demonstrate mastery of mathematical knowledge and skills through assessment, class work, and application of concepts to tasks. According to Eke, Ene and Okere (2025) academic achievement can be seen as measurable performance in cognitive and practical areas, usually reflected in test scores, examination results, and skill acquisition. Eze (2025), pointed out that achievement can be understood as the degree to which students attain intended learning outcomes in a subject area, especially after instruction. In the same vein, achievement in mathematics may be seen as learners' ability to use mathematical knowledge accurately, confidently, and independently in solving problems.

Despite the importance of mathematics, poor students' academic achievement remains a recurring challenge in Nigeria. Researchers, Nigerian educators, and scholars have repeatedly noted that students' performance in mathematics in WAEC, NECO, and similar examinations has remained unsatisfactory, with many candidates failing to secure the required credit passes for further studies (Eze, 2025). This pattern and system have raised concern because poor mathematics performance limits and also restricts access to tertiary education. Hence, weakens students' chances and interest in entering science- and technology-related fields. The persistence of low achievement could be linked to factors such as teacher-centred methods, inadequate instructional support, weak foundational learning, and limited innovation in classroom practice.

Topical discussions in Nigerian education also suggest that the problem is not basically one of student effort, but of instructional relevance in a swiftly changing world. Scholars have argued that traditional methods alone may no longer be sufficient to meet the learning needs of diverse students, especially in a system where class sizes are large and learner differences are enormous. This concern has created space for digital and scientific solutions that can provide more flexible as well as personalized support to both teachers and learners (Liu, 2022). Artificial intelligence has therefore emerged as a likely support system in the teaching and learning of mathematics. Artificial intelligence can assist teachers by adapting instruction to individual learners, automating routine tasks, giving immediate feedback, tracking learners, and supporting assessment. According to Okere, Onoja, Njoku, Oguebie, Ugwu and Ugwuanyi

(2024), stated that Artificial Intelligence is the development of computer systems capable of performing tasks that basically require human intellectual ability to carry out tasks.

Conceptually, artificial intelligence could be described as the development of computer systems that have the power to perform tasks that need human intelligence. Idris, Okere, Oguguo, Dimkpa, Odo, Yohanna, Omatalu, and Chinweike (2025) pointed out that artificial intelligence is very important in improving students' achievement because it promotes academic engagement. However, the success of AI in education depends largely on the teachers, because teachers decide when, how, and whether technology is used in teaching. This is the reason teachers' readiness has become a critical issue. According to Ayanwale, Sanusi, Adelana, Aruleba, Oyelere (2022), teachers' readiness can be defined as the state of reflecting teachers' preparedness to teach AI, which involves teachers' confidence in teaching and their perception of AI relevance. Darmawan, Rahman, and Thamrin (2024) see teachers' readiness as the extent to which teachers are technically and psychologically prepared to adopt AI, based on their perceptions of the technology, beliefs, and skills.

Conceptually, Readiness includes teachers' confidence, knowledge, attitude, skills, and willingness to integrate AI into teaching. A study conducted by Ayanwale et al. (2022) on teachers' readiness and intention to teach artificial intelligence found that perceived relevance and confidence strongly influenced readiness among in-service teachers. Darmawan, Rahman, and Thamrin (2024) found that teachers' readiness for adopting AI is influenced by factors like optimism and innovativeness of the teachers and the environment. Another factor that is capable of affecting teachers' readiness is the years of teaching experience of the teachers. Doo, Bonk, and Kim (2021) stated that the amount of time an educator has spent working as a teacher is referred to as years of teaching experience. The duration or period of years a teacher has taught in the school is called years of teaching experience. Kin and Kim (2022) addressed that years of teaching experience significantly influence teachers' application of artificial intelligence in teaching, whereas Okere et al. (2024) stated that years of teaching experience do not significantly influence teachers' application of artificial intelligence in teaching and learning economics. Kin and Kim, however, addressed that teachers' educational qualification is a factor that influences teachers' applications of artificial intelligence in teaching and learning.

Conceptually, educational qualification could be described as those academic and educational documents or papers acquired by teachers which give them the right to teach students. Okere, Njoku, Nnenanya, Yohanna, Ugwu, Ololo and Ugwuanyi (2025) defined educational qualification as the academic and other credentials teachers have obtained that qualify them to educate students. According to Cardoso (2022), teachers' educational qualifications do not have any significant influence on the application of artificial intelligence in teaching and learning. Moreover, Okere et al. (2024) as well as Okere et al. (2025) addressed that teachers' qualifications do not significantly affect the applications of artificial intelligence in teaching and learning. Another factor that can affect teachers' readiness for the application of artificial intelligence is the gender of the teachers. According to Khanal, Belbase and Joshi (2020), gender is a social construct assigned to people as either male or female.

Gender can be described as the way people express and understand themselves as male and female. Ofosu-Ampong (2023) carried out a study on Gender differences in Perception of Artificial Intelligence. The findings indicated that gender does not have a significant influence in the applications of artificial intelligence in teaching. Additionally, Okere et al. conducted a study

on the assessment of the level of economics teachers' awareness of the applications of artificial intelligence in teaching and learning economics. The study equally examined the influence of gender. The findings indicated that gender does not have a significant influence on the level of economics teachers' awareness of the applications of artificial intelligence in teaching and learning economics. As researchers seek solutions to the existing problems of students' poor academic achievement in mathematics, capturing innovative techniques and different teaching methods, yet the students' academic achievement remains poor, the researchers deemed it necessary to investigate further into mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Purpose of the Study

The purpose of this study was to examine mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. Specifically, the study seeks to determine the extent to which;

1. Mathematics teachers are ready for the application of artificial intelligence in teaching and learning Mathematics.
2. years of teaching experience influence Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning Mathematics
3. Educational qualification influences Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning Mathematics
4. gender influences Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning Mathematics

In line with the purpose of the study, the following research questions were created for the study.

1. To what extent are Mathematics teachers ready for the applications of artificial intelligence in teaching and learning Mathematics?
2. To what extent do years of teaching experience influence Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning Mathematics?
3. To what extent does educational qualification influence Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning?
4. To what extent does gender influence Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning Mathematics?

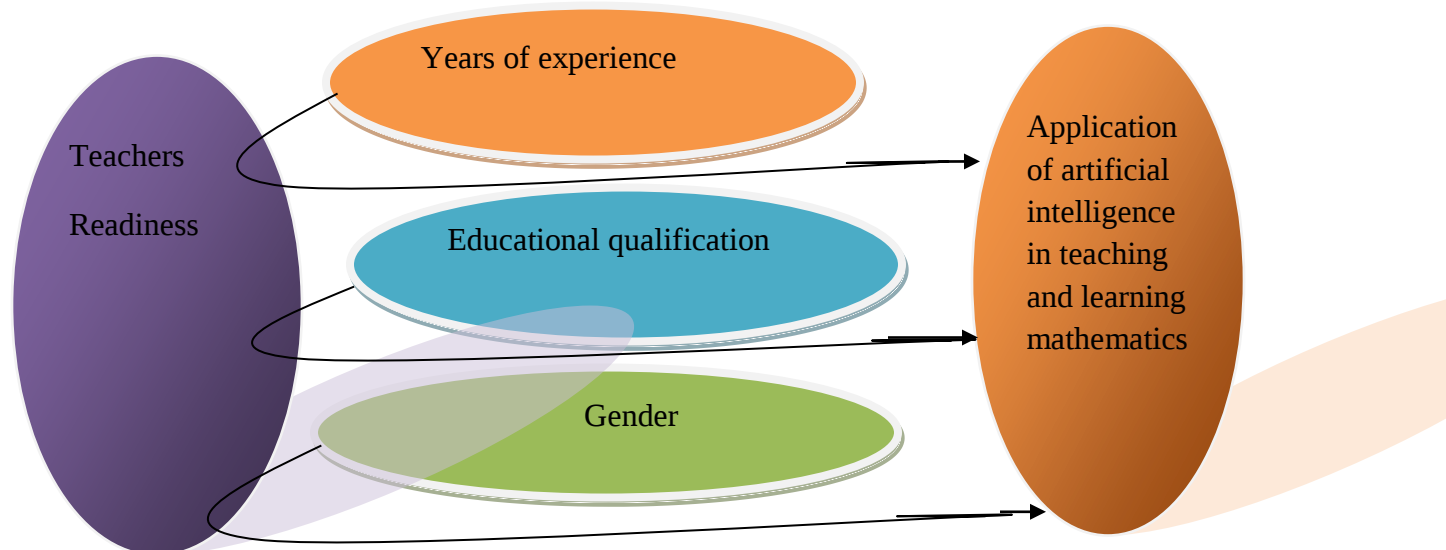
In agreement with the research questions, the following null hypotheses were formulated for the study;

Ho1: Educational qualification does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics

Ho2: Years of teaching experience do not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics

H03: Gender does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Conceptual framework



The skimmer above shows the interconnections of the variables and concepts under investigation. It shows the relationship between teachers' readiness and application of artificial intelligence in teaching and learning mathematics. The skimmer equally shows the influence of years of experience, educational qualifications, and gender on teachers' readiness for the application of artificial intelligence in teaching and learning.

Methods

The study adopted a descriptive research design; this design was deemed fit because the study was designed to describe teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. The population of the study comprised 53 teachers in Uzo-Uwani L.G.A Enugu State, which was manageable and accessible for the study. Hence, there was no sampling since the whole population was used. Teachers' readiness on the application of AI Questionnaire (TRAAIQ) was used as the instrument for data collection. Three experts validated the instrument specifically: two from research measurement and evaluation and one expert in educational mathematics. The instrument was trial-tested using 20 teachers in Nsukka L.G.A. The reliability estimate of the instrument was determined to be 0.78 using the Cronbach's alpha method. The instrument was administered and collected at the spot. Mean and standard deviation were applied to answer the research questions, while ANOVA and independent samples t-test were applied to test the hypotheses at a 0.05 level of significance. In deciding on the research questions, mean scores of 3.50 - 4.00 will be seen as a very high extent, mean scores of 2.50 - 3.49 will be considered as high extent, mean scores of 1.50 - 2.49 will be described as a low extent, and mean scores of 0.05 - 1.49 will be regarded as a very low extent.

Results

Table 1: Mean and standard deviation of the extent to which mathematics teachers are ready for the application of artificial intelligence in teaching and learning Mathematics.

S/N	ITEM STATEMENTS	N	Mean	Std. Deviation	Decision
1	To what extent are you ready to confidently use AI-based tools in teaching mathematics?	53	3.77	.42	VHE
2	To what extent are you ready to utilize available digital devices for AI-supported mathematics teaching?	53	3.67	.47	VHE
3	To what extent are you ready to handle basic technical challenges when using AI tools in teaching?	53	3.64	.52	VHE
4	To what extent are you ready to update your knowledge on emerging AI technologies in education?	53	3.62	.53	VHE
5	To what extent are you ready to improve your skills in using AI for mathematics instruction?	53	3.72	.63	VHE
6	To what extent are you ready to address ethical issues associated with AI use in education?	53	3.75	.59	VHE
7	To what extent are you ready to use AI to reduce workload in mathematics teaching tasks?	53	3.74	.58	VHE
8	To what extent are you ready to use AI tools to explain mathematical concepts to students?	53	3.52	.54	VHE
9	To what extent are you ready to apply the training you have received on AI in teaching mathematics	53	3.33	.55	HE
10	To what extent are you ready to integrate AI technologies into your mathematics lesson?	53	3.41	.60	HE
	CLUATERMEAN	53	3.69	.28	VHE

Table 1 shows the means and standard deviations of the extent to which mathematics teachers are ready for the application of artificial intelligence in teaching and learning mathematics. Items 1-8 show that mathematics teachers are to a very high extent ready for the application of artificial intelligence in teaching and learning mathematics, while 9 and 10 indicate a high extent. However, the grand mean of 3.69 with a standard deviation of 0.28 also shows that

mathematics teachers are to a very high extent ready for the application of artificial intelligence in teaching.

Research Question one: To what extent do years of teaching experience influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics?

Table 2: ANOVA result on the extent to which years of teaching experience influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics

Years of teaching Experience	N	Mean	Std. Deviation
0 to 5 yrs	27	3.76	.127
6 to 10yrs	21	3.74	.128
11 and above	5	3.08	.605
Total	53	3.69	.287

The result in Table 2 shows that mathematics teachers from 0 to 5 years of teaching experience had 3.76 mean with 0.127 standard deviation, but teachers within 6 to 10 years of teaching experience had 3.74 mean and 0.128 standard deviation while teachers from 11 years of teaching experience had 3.08 mean with 0.605 standard deviation and a total mean of 3.69 with a standard deviation of 0.287

Hypothesis 1: Years of teaching experience does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Table 3: ANOVA result on Years of teaching experience does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Years of teaching Experience	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.074	2	1.037	23.32	.000
Within Groups	2.223	50	.044		
Total	4.297	52			

The results in Table 3 show that Years of teaching experience does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. ($F(2,50) = 23.32$, $p < 0.000$). Because the p-value of 0.000 is less than the 0.05 level of significance stated in this study, the null hypothesis is rejected. Therefore, the researchers conclude that Years of teaching experience significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Research question three: To what extent does educational qualification influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics?

Table 4: Mean and standard deviation on the extent educational qualification influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics

Educational Qualification	N	Mean	Std. Deviation
NCE/OND	19	3.74	.12
BSC/HND	16	3.76	.11
MASTER	12	3.77	.14
PHD	6	3.18	.59
Total	53	3.69	.28

The result in table 4 shows that mathematics teachers whose educational qualification are NCE/OND had 3.74 mean with 0.12 standard deviation, but teachers with BSC/HND had 3.76 mean and 0.11 standard deviation while teachers that are masters holders had 3.77 mean with 0.14 standard deviation while teachers that are PhD holders had 3.18 mean with 0.59 standard deviation and a total mean of 3.69 with a standard deviation of 0.28.

Hypothesis two: Educational qualification does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics

Table 5: ANOVA result on educational qualification does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Educational Qualification	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.758	3	.589	11.31	.000
Within Groups	2.539	49	.054		
Total	4.297	52			

Result in Table 5 shows that Educational qualification significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. ($F(3,49) = 11.31, p < 0.000$) since the p-value of 0.000 is less than 0.05 level of significance pointed out in this study, the null hypothesis is rejected. Hence, the researchers conclude that educational qualifications of teachers significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Research question four: To what extent does gender influence Mathematics teachers' readiness for the application of artificial intelligence in teaching and learning Mathematics?

Table 6: Mean and Standard Deviation of Gender Influence on Mathematics Teachers' Readiness for the Application of Artificial Intelligence in Teaching and Learning

Gender	N	Mean	Std. Deviation	Std. Error Mean
MALE	29	3.64	.36	.068
FEMALE	24	3.75	.12	.025

Table 6 above shows the mean and standard deviation of the extent gender significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. The table indicates the mean of 3.64 with standard deviation of 0.36 for male and mean of 3.75 with standard deviation of 0.25 for females. Therefore, the table indicates that there are differences in the means and standard deviation however, the means and standard deviations differences are not statistically significant.

Table 7 shows the independent sample t-test on the extent gender significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Gender	N	MEAN	SD	Df	t-value	Sig.(2-tailed)
Male	29	3.64	0.36	51	1.43	1.15
Female	24	3.75	0.12			

Table 7 above shows the mean and standard deviation of the extent to which gender significantly influences mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. The table shows a mean of 3.64 with a standard deviation of 0.36 for males and a mean of 3.75 with a standard deviation of 0.12 for females. Hence, the table shows that there are differences in the means and standard deviation of male and female teachers. The result also pointed out a t-value of 1.43 with Sig. (2-tailed) of 1.15. This implies that gender does not significantly influence mathematics teachers' readiness for the application of artificial intelligence in teaching and learning mathematics.

Discussion

The findings of this study indicate that teaching experience and educational qualifications significantly influence teachers' readiness for the application of artificial intelligence in teaching and learning mathematics. The finding of this study is in line with study by Kin and Kim (2022) which stated that years of teachers experience significantly influence teachers' application of artificial intelligence in teaching however, the findings of this study is not in line with the study by Okere, et al, (2024) who stated that years of teaching experience does not significantly influence teachers application of artificial intelligence in teaching and learning. The findings of this study which said that educational qualification significantly influences teachers' readiness for the applications of artificial intelligence in teaching. This study is not in line with the study by Cardoso (2022), who found that educational qualifications do not have any significant influence

on the application of artificial intelligence in teaching and learning. Again, the findings of this study are not in line with the study of Okere et al. (2024) as well as Okere et al, (2025), who addressed that teachers' qualifications do not significantly affect the applications of artificial intelligence in teaching and learning. The finding of this study is in line with the study of Ofosu-Ampong, who said that gender does not have a significant influence on the applications of artificial intelligence in teaching. Again, the findings of this study are in line with the study of Okere et al., who said that gender does not significantly influence economics teachers' awareness of the applications of artificial intelligence in teaching and learning economics. The reason why the result appears like this could be that both male and female teachers embraced artificial intelligence because it helps teachers in organizing their lessons adequately. However, teachers should make judicious use of their problem-solving ability and critical thinking skills when applying artificial intelligence.

Conclusion

This study shows that teachers are highly ready for the applications of artificial intelligence in teaching and learning. Furthermore, teaching experience and educational qualifications were found to have a significant effect on teachers' readiness for the application of artificial intelligence in teaching and learning. The study also shows that gender does not have any significant influence on teachers' readiness for the application of artificial intelligence in teaching and learning. Hence, an individual can conclude that if teachers obtain more qualifications and have more experience, they will be more ready and eager to bring in the application of artificial intelligence in teaching and learning mathematics, thereby enhancing students' academic achievement in mathematics.

Recommendations

1. Gender of the teachers should not be given priority while exposing the teacher on AI awareness and applications. Hence, both male and female teachers should be involved.
2. Teachers should always apply ethical considerations while applying AI in teaching
3. The government should organize seminars for teachers to create more awareness on AI tools
4. School authorities should encourage in-service training for teachers to obtain more educational qualifications, as this will help to improve their desire for AI applications.

Reference

- Ayanwale, M. A., Sanusi, I. T., Adelana, O. P., Aruleba, K. D., & Oyelere, S. S. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. *Computers and Education: Artificial Intelligence*, 3, 100099.
- Benjamine, G., F. & Pierce, T., D. (2019). Nature of Mathematics. *Standard Encyclopedia of Philosophy*, 6(2), 234-247. Routledge.
- Darmawan, E., Rahman, T. K. A., & Thamrin, N. R. (2024). Evaluating readiness and acceptance of artificial intelligence adoption among elementary school teachers. *Jurnal Online Informatika*, 9(2), 228-237.
- Eke, J. N., Ene, C. U. & Okere, I. J., (2025). Students' interest as predictors of senior secondary school students' academic achievement in radioactivity in Obollo-Afor Education Zone, Enugu State. *African Journal of Science, Technology and Mathematics Education*, 11(3) pp 152-159,

- Eze, E. P. (2025). Teachers' awareness and perception on application of artificial intelligence in teaching and learning of mathematics in secondary schools in Nsukka Education Zone Enugu State. (unpublished master's project, Science Education, University of Nigeria Nsukka).
- Hom, E.J. (2020). What is Mathematics? *Mathematician's Brian*, 5-10. Princeton: University Press. <https://doi.org/10.2307/j.ctv39x60j.5>
- Idris, N. O., Okere I. J., Oguguo, B. C.E., Dimkpa, C. H., Odo, A. C., Yohanna, I., Omatalu, D. I., Chinweike, J. N. (2025). The role of artificial intelligence in enhancing chemistry education: a pathway to improve student's performance and academic achievement in Nsukka Education Zone. *International Journal of Research And Innovation In Social Science(Ijriss)* 19(6) 5043-5049
- Liu, X. (2022). The Impact of Artificial Intelligence on Mathematics Education: A Meta-Analysis. *Journal of Educational Psychology*, 114(3), 531-544.
- National Educational Research and Development Council (NERDC, 2018). Senior secondary Education curriculum for Mathematics: NERDC, Abuja, Nigeria.
- Okere, I. J. Onoja E. A., Njoku O., Oguebie, L.C., Ugwu, C. E., & Ugwuanyi, C. S. (2024). Assessment of the level of economics teacher's awareness of the applications of artificial intelligence in teaching and learning economics. *Journal of Educational Research on Children, Parents & Teachers*, (5)2 pp 279-288
- Okere, I. J., Njoku, O., Nnenanya, G. C., Yohanna, I., Ugwu, C. E., Ololo K. O. & Ugwuanyi, C. S. (2025). Assessment of physics teachers' perception of the applications of artificial intelligence in teaching and learning of physics. *African Journal of Science, Technology and Mathematics Education* 11(2) pp 197-204