

Assessment of Physics Teachers' Perception of the Applications of Artificial Intelligence in Teaching and Learning of Physics

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Abstract

This study was conducted to examine teachers' perceptions of the applications of artificial intelligence (AI) in teaching physics. The study was carried out in Okigwe Education Zone 2 of Imo State using a descriptive design. The population comprised 36 teachers. Physics Teachers' Perception of the Application of AI Questionnaire (PTPAAIQ) was used to collect data. Reliability of PTPAAIQ was determined to be .78 using Cronbach's alpha. Mean and standard deviation were used to analyze the data in order to answer the research questions, while independent samples t-test and ANOVA were used to test the hypotheses at 5% probability level. The result showed that Physics teachers have low perception of the applications of AI. Gender, experience and qualification do not have any significant influence on physics teachers' perception of the applications of AI. From the findings, it was recommended among others that, government should organize workshops for Physics teachers on the application of A.I.

Keywords: Teachers perception, artificial intelligence and Physics.

Introduction

Physics, as a core science subject, plays a crucial role in the scientific and technological development of any nation. According to Okoye and Nwuba (2024), Physics is traditionally defined as the branch of science concerned with the nature and properties of matter and energy. It involves studying phenomena such as motion, forces, electricity, magnetism, heat, light, and atomic structure. Young and Freedman (2020) define Physics as an integral part of science that explores the interactions between matter and energy. Again, Physics is a branch of science concerned with the study of matter, energy and the fundamental forces of nature and the interactions between them (Jackson, 2023). Physics refers to the secondary school subject that engages students in understanding natural phenomena through experimentation, mathematical analysis, and

conceptual reasoning, as outlined in the Nigerian secondary school curriculum. The objectives and important of teaching physics at the secondary level include developing students' problem-solving skills, fostering critical thinking, and preparing students for further education in science-related fields (Federal Ministry of Education, 2013). It also equips students with scientific literacy needed to make informed decisions in a technologically advancing society. Physics helps students appreciate the role of science in national development and encourages innovation and creativity (Nigerian Educational Research and Development Council NERDC, 2012).

Despite its recognized importance, students' performance in physics at the secondary school level has been persistently low. WAEC Chief Examiners' Reports (2021, 2024) highlight poor conceptual

understanding, inadequate teaching methods, and lack of instructional resources as key contributors. A study by Jackson (2023) showed that over 60% of students who sat for physics in the SSCE scored below credit level. This persistent underperformance suggests a need for pedagogical reform and technological integration to improve learning outcomes. Much effort has been put on by scholars in ensuring better physics teaching and learning. Over the course of time, concerted efforts have been made by the governments, teachers and stakeholders to promote the instruction and acquisition of knowledge of physics. Researchers have emphasized the need for learner-centered and technology-supported approaches in teaching physics. According to Akinbobola (2015), the use of hands-on, inquiry-based learning can demystify complex physics concepts. According to Baker (2021), there is an upward demand that Artificial intelligence should be established in teaching and learning because the intervention of it will help to improve student's knowledge, performance and academic achievement, especially in Physics. According to Yaping, Junjie and Nor (2022) artificial intelligent can be define as the ability of computers to understand, interpret, and create human language as well as enabling tasks like machine translation, speech recognition and sentiment analysis. Okere, Onoja, Njoku, Oguebie, Ugwu and Ugwuanyi (2024), pointed out that Artificial Intelligence could be seen as the development of computer systems that is capable of performing tasks that actually require human intelligence. Considering the remote nature of some areas, most teachers may not have a good idea, view and notion that propel the applications of artificial intelligence in teaching thereby necessitating either wrong or good perceptions of the applications of artificial intelligence.

Therefore, teachers' perception could be described as how teachers demonstrate their expertise in teaching and learning. According to Abdulkarim, Nsofor, Tukura and Falode (2022), teachers' perception is seen as teachers understanding of pedagogical practices, knowledge as well as their ability to effectively improve student learning. Glaze (2023) defined teachers' perception as the way teachers' perceive their students' backgrounds, abilities, motivations and interests. Teachers' perception could be seen as the way teachers interpret and understand their own their students, teaching methods and overall educational experience.

Although teachers' gender could be a factor which is capable of affecting teachers' perception of

artificial intelligence in teaching and learning. According to Cardoso (2022), gender is a factor that can influence the applications of artificial intelligence. Khanal, Belbase and Joshi (2020), explain gender as a social construct that is allocated to individuals as either male or female. Ofosu-Ampong (2023) carried out a study on Gender differences in Perception of Artificial Intelligence. This study by Ofosu-Ampong was carried out in Accra Ghana. The findings show that gender does not have any significant influence in the applications of artificial intelligence in teaching. Again, Wardat, Tashtoush, AlAli and Saleh, (2023) conducted a study on Artificial Intelligence in Education: Mathematics Teachers' Perspectives, Practices and Challenges. The finding shows that gender does not have any significant effect on teachers' perceptions on the application of artificial intelligence in teaching and learning. Another factor that is capable of influencing teachers' perception is teachers Years of experience.

Years of teachers' experience could be seen as the number of years an individual spent will teaching. Doo, Bonk and Kim (2021) defined years of teaching experience as the total time or period a teacher spent working as a teacher. According to Kin and Kim (2022), years of teaching experience significantly influence teachers' application of artificial intelligence. Okere, et al, (2024), pointed out that teachers' years of experience do not have any significant influence in the applications of artificial intelligence in teaching and learning. Kin and Kim (2022) however, detailed that teachers' educational qualification is an essential factor that can affect teachers' applications of artificial intelligence in teaching.

Hence, teachers' qualification or educational qualification could be seen as academic training and exposure as well as credentials that teachers have acquired that qualifies them to teach. 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) pointed out that educational qualification does not have any significant effect on the applications of artificial intelligence in teaching and learning. Based on the poor academic achievement of students in Physics and the need for the inclusion of artificial intelligence in teaching and learning Physics, the researchers deemed it necessary to examine physics teachers' perception of the application of artificial intelligence in teaching and learning.

Purpose of the study

The main purpose of this study was to explore physics teachers' perception of the application of artificial intelligence in teaching and learning Physics. Particularly, the study sought to examine the;

1. Physics teachers' perception of the application of artificial intelligence in teaching and learning Physics.
2. Influence of gender on Physics teachers' perception of the application of artificial intelligence in mathematics teaching and learning
3. Influence of years of teaching experience on Physics teachers' perception of the application of artificial intelligence in teaching and learning Physics.
4. Influence of educational qualification on Physics teachers' perception of the application of artificial intelligence in teaching and learning physics.

In line with the purpose of the study, four research questions were posed thus;

1. What is the Physics teachers' perception of application of artificial intelligence teaching and learning Physics?
2. What is the influence of gender on Physics teachers' perception on the application of artificial intelligence in Physics teaching and learning?
3. What is the influence of years of experience on Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics?
4. What is the influence of educational qualification on Physics teachers' perception of the application of artificial intelligence in teaching and learning physics?

Hypotheses.

The following null hypotheses were tested at 0.05 level of significance.

Ho₁: Teachers' gender does not significantly influence Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

Ho₂: Years of experience do not significantly influence Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

Ho₂: Educational qualification does not significantly influence Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

Methods

The study employed a descriptive research design. Descriptive research design is that research design which collects and describes data in a logical manner to in order to determine the features and characteristics of a particular phenomenon, population or event that is of interest to the researcher (Nworgu, 2015). This design is suitable for the study because the researchers have interest in collecting data about teachers' perceptions of the application of artificial intelligence and describing the data in a logical order. The study was conducted in Okigwe Education Zone 2 of Imo state which comprised of three Local Government Area; Ehime Mbano L.G.A, Ihitte Uboma L.G.A, and Obowo L.G.A in Imo State. The population of the study comprised of all the 36 senior secondary school II Physics teachers in 2023/2024 academic session in Okigwe Education Zone 2 of Imo state. All the 36 Physics teachers from the three local governments that makes up the zone. The all the population was used because the population is manageable and hence, no sampling. The 4 local government in Okigwe education zone which were used for the study comprising of 11 male 6 female Physics teachers in 17 public secondary schools in Ehime Mbano, 7 male 4 female in 11 public secondary schools in Ihitte Uboma and male 6 female 2 in 8 public secondary schools in Obowo. Making a Sum of 36 Physics teachers' from Okigwe Education Zone 2 of Imo State. Physics Teachers perceptions on the application of artificial intelligence Questionnaire (PTPAAIQ) was used as an instrument for data collection; Contains m two sections; sections A and B. Section A extracted demographic information of the respondents while section B contains 10 items consider on a four-point scale. 4-very high extent, 3-high extent, 2-low extent and 1-very low extent. The instrument was validated by three experts in Measurement and Evaluation from the Department of Science Education, Faculty of Education in University of Nigeria, Nsukka. The instrument (PTPAAIQ) was trial tested on 20 Physics teachers from Okigwe Education Zone 2 of Imo State and a reliability estimate of 0.78 was obtained using Cronbach Alpha. In order to get maximum return of instruments, the data was collected immediately. The data collected

was analyzed using mean and standard deviation while independent sample t-test and Analysis of Variance were used to test the hypotheses at 0.05 alpha level of significance. In deciding on the research questions, mean scores of 3.50 - 4.00 will be accepted as very

high extent, mean scores of 2.50 - 3.49 will be accepted as high extent, mean scores of 1.50 - 2.49 will be accepted as low extent, mean scores of 0.05 - 1.49 will be accepted as very low extent.

Results

Table 1: Mean and standard deviation of Physics teachers' perception of the application of artificial intelligence in teaching and learning Physics

S/N	Item statement	n	Mean	Std. D	Remark
1.	To what extent do you think AI can contribute to the development of students' problem-solving skills in Physics?	3 6	1.83	1.00	LE
2.	To what extent do you believe that AI can assist in promoting a deeper understanding of Physics concepts among students	3 6	1.91	.69	LE
3.	To what extent do you use AI in teaching and learning	3 6	2.00	.86	LE
4.	To what extent do you think it is important for teachers to be trained in using AI tools for teaching Physics	3 6	1.72	.78	LE
5.	To what extent is your expectations regarding the impact of AI on the future of Physics education	3 6	1.81	.62	LE
6.	To what extent do you think AI can assist in assessing students' understanding of Physics concepts	3 6	1.69	.62	LE
7.	To what extent are you confident in your ability to use AI tools effectively in teaching Physics?	3 6	1.89	.75	LE
8.	To what extent do you think AI can personalize learning for students in Physics?	3 6	2.00	.91	LE
9.	To what extent do you think AI can support students with different learning needs in physics	3 6	1.83	.78	LE
10.	To what extent do you use AI-based tools or applications in your teaching	3 6	1.72	.66	LE
Cluster mean		3 6	1.84	.33	LE

Table 1 shows the means and standard deviations of the extent to which Physics teachers perceive the application of artificial intelligence in teaching and learning Physics. Considering the fact that items 1 to 10 show low extent (LE) of teachers' perception on the applications of artificial intelligence in teaching and learning, this implies that Physics

teachers do not see the need for the application of artificial intelligence in teaching and learning Physics. The grand mean of 1.84 with a standard deviation of 0.33 also shows that Physics teachers did not support the application of artificial intelligence in teaching and learning Physics.

Tale 2: Mean analysis of the influence of gender on Physics teachers' perception of the application of artificial intelligence in teaching and learning Physics

Gender	n	Mean	SD	df	t-value	Sig. (2-tailed)
Male	24	1.74		0.30	35	0.79
Female	12	2.05		0.31		0.007

Table 2 above shows the mean and standard deviation on the extent to which gender significantly influence Physics teachers' perception of the

application of artificial intelligence in teaching and learning Physics, The Table indicates the mean of 1.74 with a standard deviation of 0.30 for male and 2.05

with standard deviation of 0.31 for females. Therefore, the Table shows that there are differences in the means and standard deviation but the differences are not significant.

Table 2 above shows the mean and standard deviation on the extent gender significantly influences Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics. The table indicates a mean of 1.74 with a standard deviation of 0.30 for male and 2.05 with standard

deviation of 0.31 for females. Meaning that, the Table shows that there are differences in the means and standard deviation of male and female Physics teachers. The result, however shows a t-value of 0.79 with Sig. (2-tailed) of 0.07 hence the hypothesis was not rejected. This means that gender does not have any significant influence on Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

Table 3: ANOVA for the influence of years of teaching experience Physics teachers' perception of the application of artificial intelligence in teaching and learning Physics

Years of teaching Experience	n	Mean	Std. Deviation
0 to 5 yrs	14	1.97	.36
6 to 10yrs	8	1.64	.26
11 and above	14	1.84	.29
Total	36	1.84	.33

The result in Table 3 shows that Physics teachers from 0 to 5 years of teaching experience had 1.97 mean with 0.36 standard deviation, but teachers within 6 to 10 years teaching experience had 1.64

mean and 0.26 standard deviation while teachers from 11 years teaching experience had 1.84 mean with 0.29 standard deviation and a total mean of 1.84 with a standard deviation of 0.33

Table 4: ANOVA for the influence of years of teaching experience on Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.569	2	.285	2.848	.072
Within Groups	3.299	33	.100		
Total	3.869	35			

Result in Table 4 shows that Years of Physics teaching experience do not significantly influence Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics, $F(2,33) = 2.848, p = .072$ because the p-value of .072 is greater than 0.05 level of significance pointed out in

this study, the null hypothesis is upheld. Therefore, the researchers conclude that Years of teaching experience do not significantly influence Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

Table 5: Mean analysis of the influence of educational qualification on Physics teachers' perceptions of the application of artificial intelligence in teaching and learning Physics

Educational qualification	n	Mean	Std. Deviation
NCE/OND	11	1.81	.31
BSC/HND	23	1.82	.33
MASTER	2	2.30	.00
Total	36	1.84	.33

The result in Table 5 indicates that Physics teachers whose educational qualification are NCE/OND had 1.81 mean with 0.31 standard deviation, but teachers with BSC/HN had 1.82 mean

and 0.33 standard deviation while teachers that are master's holder had 2.30 mean with 0.00 standard deviation and a total mean of 1.84 with a standard deviation of 0.33.

Table 6: ANOVA for the influence of educational qualification on Physics teachers' Perception on the application of artificial intelligence in teaching and learning Physics

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.441	2	.220	2.121	.136
Within Groups	3.428	33	.104		
Total	3.869	35			

Result in Table 6 shows that educational qualification does not significantly influence Physics teachers' awareness on the application of artificial intelligence in teaching and learning economics, $F(2,33) = 2.121, p = .136$ since the p-value of .136 is greater than 0.05 level of significance pointed out in this study, the null hypothesis is upheld. Therefore, the researchers inferred that the educational qualification of teachers does not significantly influence Physics teachers' perception on the application of artificial intelligence in teaching and learning Physics.

Discussion of the study

The findings of this study indicated that teachers have low perception of the applications of artificial intelligence in teaching and learning Physics. The finding of this study also stated that gender, teaching experience and educational qualifications do not have any significant influence in teaching and learning Physics. The finding is in line with the study by Ofosu-Ampomg (2023) that gender does not have any significant influence in the applications of artificial intelligence in teaching. The findings are also in agreement with the findings of Wardat, Tashtoush, AlAli and Saleh, (2023) that gender does not have any significant effect on teachers' perceptions on the

application of artificial intelligence in teaching and learning. However, the findings of this study are in contrast with the findings of Kin and Kim (2022) that years of teaching experience significantly influence teachers' application of artificial intelligence. But the findings of this study are in agreement with Okere et al. (2024), that teachers' years of experience do not have any significant influence in the applications of artificial intelligence in teaching and learning. However, the findings of the study are in consonant with the findings of Cardoso (2022), as well as the findings of Okere et al. (2024) that teachers' educational qualifications do not have any significant influence on the application of artificial intelligence in teaching and learning

Conclusion

The study indicates that teachers have low perception on applications of artificial intelligence in teaching and learning Physics. Additionally, gender does not have any significant influence on the perception of the applications of artificial intelligence in teaching and learning Physics, teaching experience was found to have no significant influence on teachers' perception on the application of artificial intelligence in teaching and learning Physics. The

study also shows that educational qualification does not have any significant influence on teachers' perception on the application of artificial intelligence in teaching and learning Physics. Hence, an individual can infer that if teachers have very high perception of the application of artificial intelligence in teaching and learning, students' academic achievement in Physics will get better. Furthermore, teachers' objective and educational objective will be ascertained.

Recommendations

1. Principals should advise Physics teachers to embrace artificial intelligence in teaching.
2. The government should arrange in-service training for Physics teachers on artificial intelligence and the importance in teaching and learning.
3. Both male and Female teachers of different educational qualification should be exposed to the need for AI in teaching and learning.
4. Regardless of the degree of teachers' experience, they should be taught the benefit of applying artificial intelligent tools in teaching and learning Physics.

Reference

- Abdulkarim, O. R. , Nsofor, C. C., Tukura, C. S. & Falode, O.C., (2022). Mathematics Teachers' Awareness, Perception and Attitude Towards e-learning Instructional Authoring Tool among Secondary Schools in Minna, Niger State, Nigeria. *African Scholars Journal of Education Research and Library Practice (JERLP-8)*, 24(8),40-43.
- Akinbobola, A. O., & Bada, A. A. (2019). Assessment of resources for physics teaching in Nigerian senior secondary schools. *International Journal of Humanities Social Sciences and Education*, 6(8), 1-13
- Baker, M., (2021). The roles of models in Artificial Intelligence and Education research: a prospective view. *International Journal of Artificial Intelligence in Education*, 11 (20),39-43
- Cardoso, L. M. A. (2022). The impact of artificial intelligence in education from teachers' perspective: a case study for primary and secondary schools. Retrieved from https://scholar.google.com/scholar?hl=en&as_sd
- t=2005&sciodt=0%2C5&cites=13195990392594617&scipsc=&q=do+teachers+qualifications+effect+the+awareness+of+artificial+intelligence+in+teaching+economics&btng=#d=gs_qabs&t=1721723579781&u=%23p%Doltlrs-k6D4J
- Doo, M. Y., Bonk, C. J., & Kim, J. (2021). An investigation of under-represented MOOC populations: motivation, self-regulation and grit among 2-year college students in Korea. *Journal of Computing in Higher Education*, 33, 419-440.
- Educational Research and Development Council (NERDC). (2012). *Nigerian secondary school curriculum for physics*. NERDC Press.
- Federal Ministry of Education. (2013). *National policy on education*. NERDC Press.
- Glaze, A., R., (2023). Teachers' Conceptions of Mathematics and Intelligent Tutoring System Use" All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 7539. Retrieved from https://digitalcommons.usu.edu/etd/7539vhttps://scholar.google.com/scholar?hl=en&as_sdt=2005&sciodt=0%2C5&cites=13https://www.researchgate.net/figure/Relationship-between-digital-awarenesswithhttps://www.researchgate.net/figure/Relationship-between-digital-awarenesswith
- Jackson, G. (2023). *What is the modern definition of physics?* Physics-Network. Retrieved from <https://physics-network.org/what-is-the-modern-definition-of-physics/>
- Khanal, B., Belbase, S., & Joshi, D. R. (2021). Effect of Digital Awareness on Mathematics Achievements at School to University Levels in Nepal. *Mathematics Teaching Research Journal*, 12(4), 47-68.
- Kin, N.J & Kim, M.K. (2022). Teacher's perceptions of using artificial intelligence-based educational tool for scientific writing. *Frontiers in Education*, 7(1), 1-13, <https://doi.org/10.3389/feduc.2022.755914>
- Nworgu, B. G. (2015). *Educational research: Basic issues and methodology* (3rd ed.). University Trust Publishers.
- Ofosu-Ampong, K. (2023). Gender differences in perception of artificial intelligence-based tools. *Journal of Digital Art & Humanities*, 4(2), 52-56.
- Okere, I. J., Onoja, E. A., Njoku, O., Oguebie, L. C., Ugwu, C. E., & Ugwuanyi, C. S. (2024). Assessment of the level of economics teachers'



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awareness of the applications of artificial intelligence in teaching and learning economics.

Journal of Educational Research on Children, Parents & Teachers, 5(2), 279–288.

Okoye, N. T., & Nwuba, I. S. (2024). Probing computer-assisted instructional effect on academic achievement of secondary school students in physics. *Journal Plus Education/Educația Plus*, 36(2).

Ugwuoke, C. C., & Okonkwo, A. O. (2023). Budget Padding and Its Effects on the Nigerian Economy: A Theoretical Review. *Global Journal of Finance and Business Review/ISSN, 1694, 450X*. Omeke, J. O., & Okafor, M. O. (2025). Creativity and Resourcefulness: A Study of JK Art Enterprise and the Valorization of Coconut Shell. *Business Education Research*, 1(1), 126-132.

Wardat, Y., Tashtoush, M., AlAli, R., & Saleh, S. (2024). Artificial intelligence in education: mathematics teachers' perspectives, practices and challenges. *Iraqi Journal for Computer Science and Mathematics*, 5(1), 60-77.

West African Examinations Council. (2021 & 2024). *Chief examiners' reports: Physics*. WAEC.

Yaping, Q., Junjie P and Nor, A., I., (2022). Effectiveness of Artificial Intelligence (AI) in Improving Pupils' Deep Learning in Primary School Mathematics Teaching in Fujian Province, Computational Intelligence and Neuroscience. Retrieved from <https://doi.org/10.1155/2023/9817215>

Young, H. D., & Freedman, R. A. (2020). *University physics with modern physics* (15th ed.). Pearson Education.