



SCIENCE EDUCATORS' PERSPECTIVE ON THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI) IN THE TEACHING OF CHEMISTRY IN LAGOS STATE, NIGERIA

FOLORUNSHO, MICHAEL DAMOLA, UMOREN OTOH DAYO, AKEEB, SHERIFF, MICHAEL EDISON EDEM, CHUKWUEMELIE NNAEMEKA DANIEL, CHINEYEM EBITE AND MMADUEKWE, EBUKA PAUL
Email: Ebitechineyem@gmail.com, folorunshomichael213@gmail.com

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ABSTRACT

Generative models are artificial intelligence systems that can create humanlike text, pictures, and videos by learning from complex datasets. They use deep learning techniques to understand and replicate the patterns, contents, and structure of language. The research aims to investigate the attitudes, beliefs, and perceptions of science educators in Lagos State regarding the use of Generative AI (GAI) in the teaching of Chemistry. The study adopted a well-structured electronic questionnaire for data collection. Then it was subjected to descriptive and inferential statistics using one-way Analysis of variance (ANOVA). The study revealed no significant difference in Chemistry educators' perception of GAI between educators' gender and teaching experience. This implies that the gender and experiences of the Science educators do not determine the possession of GAI knowledge or enthusiasm to teach it in teaching and learning. In conclusion, 21st-century science educators are more conversant with GAI and are ready to explore its use. Furthermore, administrators with 10 years and above experience are very enthusiastic about the technology due to the ease of delivering their duties. One hundred (100) educators are chosen from the district (V) out of 140 teachers registered with the state public school in Lagos state using simple random techniques.

KEYWORDS: Chemistry; Educators; Generative Artificial Intelligence (AI); Perceptive; Science; Teaching;

INTRODUCTION

Artificial intelligence (AI) is the study of ideas to bring into being machines that respond to stimuli peculiar to humans through their ability for contemplation, judgment, and intention.

These machines organize information in themselves, capable of sensing human emotions and responding to various questions based on their robust dataset and continuous learning from their interactions with users.

Folorunsho, Michael Damola, Department of Science Education, University of Ilorin, Kwara State, Nigeria
Umoren Otoh Dayo, Chemical Science Unit, Pure Sciences, Abeokuta, Ogun State, Nigeria
Akeeb, Sheriff, Department of Mathematics, Georgia State University, USA
Michael Edison Edem, Department of Community Medicine, University of Jos
Chukwuemelie Nnaemeka Daniel, Computer Science Department, Enugu State University
Chineyem Ebite, Department of Chemistry Clemson University, USA
Mmaduekwe, Ebuka Paul, Department of Information and communication science, Ball State University, Muncie Indiana

All this feat is due to its complex hardware and software, database, and knowledge-based processing model, which demonstrates its ability for effective human characteristics like decision-making (Shubhendu & Vijay 2013). Artificial Intelligence is significantly impacting higher education, influencing the academic and everyday lives of students, especially in developed countries (Chen et al., 2020; Tahiru, 2021). AI applications in education, such as adaptive learning platforms, automated assessments, and AI-powered writing tools, are providing personalized learning experiences and real-time feedback (Zawacki-Richter et al., 2019; Holmes & Tuomi, 2022;). The field of AI in education (AIED) is expanding, benefiting not only learners but also educators and institutions (Chen et al., 2020; Hwang et al., 2020; Nemorin et al., 2023).

Generative Artificial Intelligence (GAI) refers to a type of AI based on unsupervised machine learning models pre-trained on specific datasets, capable of generating new content like text, images, and sound. Large Language Models (LLMs), a subtype of GAI, are artificial neural networks designed to process and generate natural language text. They utilize deep learning algorithms to learn language patterns and structures from vast amounts of textual data and generate new text based on prompts or inputs (Martin, 2023). Generative AI technology, which relies on complex algorithms to analyze human language patterns on the internet, faces significant reliability concerns. This AI does not discern truth from falsehood, leading to potential inaccuracies, often referred to in the tech industry as "hallucinations." Some researchers believe this term understates the issue's severity. There are growing worries that individuals might overly depend on generative AI for critical advice, such as medical and legal information, which could lead to problematic decision-making (Weise et. al, 2023).

Elementary school students can use large language models (LLMs) to help improve reading and writing skills by suggesting syntactic and grammatical corrections, enhancing writing style, and fostering critical thinking. These models generate questions and prompts that encourage students to critically engage with texts. Additionally, they aid in reading comprehension by

providing summaries and explanations of complex material, making it easier for students to understand (Kasneci et. al., 2023). Middle and high school students can also utilize large language models (LLMs) to aid in learning languages and writing styles across subjects like mathematics, physics, Chemistry, literature, etc. These models generate practice problems and quizzes, helping students understand and retain material. LLMs also develop problem-solving skills by providing explanations, step-by-step solutions, and related questions, enhancing reasoning and analytical thinking (Kasneci et. al., 2023).

The potential disruptive impact of generative AI, like ChatGPT, is a topic of intensive discussion in both academia and the public (Li et al., 2023; Lo, 2023). The integration of ChatGPT and similar AI tools in education has sparked concerns among stakeholders and scholars regarding assessment, examination, and academic integrity (Cotton et al., 2023; Eke, 2023; Yeadon & Halliday, 2023). These AI tools can mimic student work closely, making it challenging to detect plagiarism and cheating, thus necessitating a reevaluation of traditional assessment methods (Farazouli et al., 2023). Additionally, ChatGPT's technical limitations, such as creating incorrect information and "hallucinations," lead to reliability concerns (Weise & Metz, 2023). Furthermore, issues related to copyright, data privacy, and security are significant as AI becomes more integrated into educational systems (ibid.). The availability of advanced AI tools like ChatGPT can create an imbalance in the educational landscape, advantaging students with access to these tools over those without, thus reinforcing educational inequalities (Cotton et al., 2023; Adiguzel et al., 2023). Moreover, the substantial energy consumption of AI systems poses environmental sustainability concerns (Kasneci et al., 2023). While ChatGPT is a robust language generation model, it has notable limitations. One primary limitation is its inability to access external information or browse the internet, restricting it from generating text based solely on the input provided. Consequently, ChatGPT may fail to provide accurate or up-to-date information on various topics and may struggle with complex or unconventional questions.

Additionally, since ChatGPT is trained on a large dataset of human language, it may generate responses that contain biased or offensive language. Users must be aware of these limitations and use the model appropriately. These issues indicate that while ChatGPT holds potential, it also prompts critical discourse about AI's impact on education and society, potentially affecting diverse groups differently and raising questions of power, disadvantage, and marginalization (Selwyn, 2022).

The importance of artificial intelligence in educational research cannot be underestimated. The present technological landscape and goals of education must be similar to the real world, and technology plays a crucial role in shaping human behaviour and decision-making. Students must know how to engage these AI tools, know their loopholes, and use them ethically. Therefore, integrating AI tools in education comes with many benefits (Alasadi, & Baiz, 2023). AI poses great potential as it can revolutionize the educational landscape. There is a necessity that educators are well-trained and ready to use these new tools. The introduction of AI in education brings to light a necessity for educators to develop a new form of pedagogy. The Ministry of Education will need to invest in prolonged training. This can equip educators with the necessary skills needed to integrate AI into their teaching methodology. This training should include technical training so Educators can competently operate AI. This training should include understanding AI systems, utilization of AI tools, and interpretation of data generated by these tools (Alasadi, & Baiz, 2023). The creation of resources is a primary benefit of generative AI for educators as it provides tailored materials to enhance the learning experience. Also, AI can revolutionize instructional methodologies. The optimization of time is of great advantage to educators as AI can help them in many administrative tasks like the preparation of lesson plans, and the preparation of quizzes. This advantage has made educators believe AI can bring secondary education to the apex (Amado-Salvatierra et. al., 2024). However, for educators to implement GAI in Education, adequate training must be provided to aid them in its integration and preparedness for new developments. In addition, certifications like

diplomas, courses, blogs, and massive learning open courses are of help in preparing educators for the implementation of Generative AI in education. There are few significant differences in educators' perceptions of generative AI based on gender and teaching experiences. There have been numerous researches on the perception of educators on generative AI in Education. However, there have been few researches that are discipline-specific. Most especially, there has not been any research about how Science teachers can implement GAI into Education, especially in the teaching of Chemistry. This research focused on Science educators' perception of Generative Pretrained transformers (Chat GPT, Chat GPT-4, and Gemini) in teaching and learning Chemistry in Lagos State, Nigeria

Research Questions

- What are the perceptions of GAI among chemistry educators based on t on their gender?
- What are the perceptions of GAI among chemistry educators based on their work experience?
- What are the perceptions of GAI among chemistry educators based on their qualifications?

Research hypothesis

The following research hypothesis generated from the research question raised will be tested at $p < 0.05$.

H01: There is no significant difference in GAI knowledge usage educators based on their years of experience

H02: There is no significant difference in GAI usage among educator based on their gender.

RESEARCH METHODOLOGY

Research Design

This study uses a mixed methodology, combining qualitative and quantitative approaches either sequentially or simultaneously. Creswell et al. (2007) identified four blended methodologies: triangulation, embedded, explanatory, and exploratory. This study employs the triangulation method, integrating both numerical and descriptive data to address a research question. Quantitative methodology examines variable relationships to evaluate objective ideas, often using measurable tools and statistical analysis.

It involves deductively testing ideas, employing bias safeguards, and control mechanisms to ensure generalizable and reproducible results. This approach focuses on statistical analysis with closed-ended questions and structured data collection methods, allowing for the comparison and aggregation of data from many respondents. The validity of this approach relies on carefully designed instruments. The online survey for this study targeted 134 participants, making a quantitative approach appropriate (Creswell, 2014; Flick, 2020).

In contrast, qualitative methodology seeks to understand the meanings individuals or organizations assign to social or human issues. It involves collecting data in natural settings, inductive analysis, and interpreting findings to clarify new phenomena and understand contexts. This method uses open-ended questions and less structured data collection instruments, providing detailed information about fewer participants. The validity of qualitative research depends on the researcher's expertise and rigour (Creswell, 2014; Flick, 2020).

Mixed methodology was chosen for its ability to offer more accurate insights by leveraging the strengths and minimizing the weaknesses of both approaches. Qualitative data adds depth by providing detailed accounts, while quantitative data allows for broader information collection. Additionally, mixed methodology accommodates diverse perspectives, prompting a reevaluation of conceptual frameworks and assumptions when quantitative and qualitative findings diverge. This approach enhances understanding and opens new research avenues (Venkatesh et al., 2013). The participant was given a lecture on Generative Artificial Intelligence. They were also given videos designed by LinkedIn to watch on Generative AI.

Sample and Population Technique

Every Chemistry educator in Lagos State is a potential participant in the survey aspect of the research. However, efforts are made to reach as many Chemistry educators as possible. One hundred (100) educators are chosen from the district (V) in Lagos state using simple random techniques. A diverse sample of educators was selected to ensure representation from different school settings (public and private) and teaching experience levels.

Research Instruments

The instrument used for this research is a questionnaire which best fits this survey. The questionnaire was adapted from Nyaaba et al. (2023) without criticism. The questionnaire was validated by seasoned researchers in the Department of Science Education and Technology, University of Lagos, Akoka, Nigeria. The questionnaire is divided into two sections.

Section A contains personal information about each respondent's name of school, gender, qualifications and teaching experience. Section B contains items on information on educators' expertise in their knowledge of GAI.

An electronic questionnaire was also given to participants designed in Google Forms. Educators were given this questionnaire to be filled in their general WhatsApp platform of the Chemistry Teachers Association (CHETAN) Lagos State Chapter. It contains three parts, namely Part A: Demographics (Age, Year of Experience, Qualifications). B: Multiple choice questions and C: Interview questions in four themes namely Educator efficacy, Training and Preparedness and potential challenges.

Validation of Research Instrument

The questionnaire which is the research instrument; after construction was submitted to the expert on the subject matter examined each item to ensure that it contained necessary information and that it was not ambiguous. Each item in the questionnaire was also examined alongside the research questions to see if they correlate with each other not to deviate from the main purpose of the study.

Procedures for Data Collections

The survey was given to the Chemistry Teachers Association, Lagos State Chapter President who then posted it on the general WhatsApp platform of the association. Then a copy of a short introduction about the research topic was given to educators and they were made to understand that their response would be kept with utmost confidentiality. The educators were allowed to withdraw from the research whenever they wanted to. The name of the school and the participating individual were not disclosed anytime during the research. All works taken from other authors were paraphrased summarized to reflect the author's ideas and referenced appropriately.

More so, at the end of the work, it would be subjected to plagiarism and grammar check. The data received was gathered automatically by Google Excel file which was then accessed by the researcher after the total sample needed.

Data Analysis

The collected data were analyzed using Microsoft Excel Version 13 and SPSS Version 21 for descriptive and inferential statistics respectively

RESULTS AND DISCUSSION

Results

Table 1 shows that out of 100 respondents who participated in the study. The distribution by gender 47(47%) were female while 53(53%) were male Science educators (Chemistry). The distribution of respondents by qualification 1(1%) were NCE holders, and 10(10%) were BSc. holder, 36(36%) where BSc (Ed.) holder, 13(13%) where P.G.D.E. holder, 13(13%) were MSc. holder, 26(26%) were M.Ed. holder and 1(1%) was a PhD. holder.

Table 1: DEMOGRAPHICS DATA OF RESPONDENTS

| Variable | Frequency | Percentage% |
|----------------------------|-----------|-------------|
| Gender | | |
| Male | 53 | 53 |
| Female | 47 | 47 |
| Total | 100 | 100 |
| Qualifications | | |
| NCE | 01 | 1 |
| BSc. | 10 | 10 |
| BSc.(Ed.) | 36 | 36 |
| P.G.D.E | 13 | 13 |
| MSc. | 13 | 13 |
| Med. | 26 | 26 |
| PhD. | 01 | 1 |
| Total | 100 | 100 |
| Teaching experience | | |
| 10 years above | 67 | 67 |
| 5-10 years | 06 | 6.1 |
| 6-10 years | 11 | 11 |
| Below 5 years | 16 | 16 |
| Total | 100 | 100 |

Research question 1:

What is the perception towards generative Artificial Intelligence (GAI) among chemistry

educators from secondary Schools in Lagos State?

Table 2: Descriptive Statistics of Chemistry Educator's Perception of GAI

| Item | Strongly agree% | Agree% | Neutral% | Disagree% | Strongly Disagree % | M | SD |
|---|-------------------------|----------------|-----------------|------------------|----------------------------|----------|-----------|
| Using AI may help educators to acquire more content knowledge. | 51 | 40 | 6 | 0 | 6 | 4.360 | 0.8471 |
| Educator educators and students can interact and communicate differently with the help of AI tools. | 31 | 61 | 3 | 2 | 3 | 4.150 | 0.8211 |
| AI tools can assist educator educators in improving academic achievement and grades among students. | 45 | 49 | 5 | 0 | 1 | 4.370 | 0.6765 |
| AI may assist in activating teaching and learning during difficult lessons. | 52 | 43 | 3 | 1 | 1 | 4.440 | 0.7009 |
| AI tools may help educator educators to meet different needs in the classroom. | 25 | 56 | 16 | 2 | 1 | 4.020 | 0.7652 |
| AI tools may affect the traditional approaches valuable for students learning. | 22 | 50 | 16 | 10 | 2 | 3.800 | 0.9640 |
| Inadequate knowledge of ethical issues of AI discourages me from its usage. | 8 | 35 | 20 | 29 | 8 | 3.060 | 1.1325 |
| Items | Strongly Agree % | Agree % | Neutral% | Disagree% | Strongly Disagree% | M | SD |
| AI tools may lead to parity of academic assessment among students making it difficult to assess them. | 13 | 34 | 14 | 31 | 8 | 3.130 | 1.2198 |
| Students become more independent learners from AI and may not value educators' prowess. | 16 | 37 | 7 | 34 | 6 | 3.230 | 1.2460 |
| Insufficient facilities discourage me as an educator from using AI tools. | 27 | 38 | 12 | 21 | 2 | 3.670 | 1.1464 |
| Educator educators need to learn how AI tools can be used appropriately and how they can be integrated into the current curriculum effectively. | 51 | 42 | 5 | 0 | 2 | 4.400 | 0.7654 |

N.B. The number of responses and percentage are the same so the same value is recorded for both parameters. S.D. = standard deviation M= means N=100

Perception of Chemistry educators and preparedness towards Generative AI (GAI)

From Table 2 there seems to be an alignment between educators about the need for training as they must have considered how greatly it would be of benefit if they acquire knowledge on the usage of GAI. This result can be justified by their responses in which 51% strongly agreed, and 42% agreed with the recommendation. Those who strongly disagreed are 2% while those who are neutral make up 5%. The mean score ($M=4.4$) also indicates a high level of agreement, with a very low standard deviation (0.7654) signifies the importance of training for Chemistry educators. These findings are an eye opener for the need for proper training for educators to know the use of GAI. For the potential benefits of AI to be maximized a well-structured training for Educators is needed. This claim can be confirmed

further by the open-ended questions and answers extracts from the educators:

"This a new concept. Need enlightenment."

"I don't know how it works for Chemistry"

"Insufficient tools and the usage"

"It will also be a challenge especially where there is no skilled personality to handle such irrespective of the AI usage."

"Low knowledge of the educator using AI and the students"

"Lack of technical know-how"

"AI cannot be operations where meaningful apparatus is unavailable. It will also be a challenge especially where there is no skilled personality to handle such irrespective of the AI usage."

"Computer illiteracy"

Research question 2: What are the perceptions of GAI among educator educators based on their work experience?

Table 3: Descriptive statistics of Chemistry Educators Perception of GAI based on work experience

| Teaching exp. | | Item 1 | Item2 | Item 3 | Item 4 | Item5 | Item6 | Item7 | Item8 | Item9 | Item 10 | Item 11 | Item 12 |
|----------------|------|--------|-------|--------|--------|-------|-------|-------|-------|-------|---------|---------|---------|
| Below 5 years | Mean | 4.375 | 4.313 | 4.375 | 4.438 | 4.375 | 3.875 | 4.125 | 2.875 | 3.500 | 3.188 | 3.563 | 4.438 |
| | Std. | 0.619 | 0.479 | 0.6191 | 0.727 | 0.885 | 0.718 | 0.619 | 1.025 | 1.211 | 1.276 | 1.274 | 0.512 |
| 6-10 years | Mean | 4.176 | 4.294 | 4.294 | 4.412 | 4.588 | 4.118 | 3.529 | 3.294 | 3.294 | 3.588 | 3.706 | 4.588 |
| | Std. | 1.101 | 0.771 | 0.686 | 0.795 | 0.507 | 0.600 | 1.124 | 1.263 | 1.263 | 1.176 | 1.263 | 0.507 |
| 10 years above | Mean | 4.403 | 4.075 | 4.388 | 4.493 | 4.480 | 4.030 | 3.791 | 3.045 | 3.000 | 3.149 | 3.687 | 4.394 |
| | Std. | 0.854 | 0.893 | 0.695 | 0.6825 | 0.611 | 0.816 | 0.978 | 1.160 | 1.206 | 1.258 | 1.157 | 0.762 |
| Total | Mean | 4.360 | 4.150 | 4.370 | 4.470 | 4.480 | 4.020 | 3.800 | 3.060 | 3.130 | 3.230 | 3.670 | 4.434 |
| | Std. | 0.847 | 0.821 | 0.6765 | 0.7029 | 0.611 | 0.765 | 0.964 | 1.136 | 1.219 | 1.246 | 1.146 | 0.688 |

From table 3 above a lot of inferences can be made for example below 5 years and perception towards GAI seems to be very accurate as most responders were positive about it. This leads to a very tangible mean and little standard deviation which implies that there is agreement in the data. However, items 8,9,10 and 11 respectively give abnormal results as they have a small mean and a large standard deviation which implies disagreement in the responses. However, so far it seems that young educators seem to be more friendly and enthusiastic about the use of GAI compared to their seniors who have been in the job over the years. This statement can be justified

by the disparity in the opinion of educators who are within the level of 6-10 years. Then another change comes in educators in the range of 10 years above who seem to be more enthusiastic in their approach to GAI and as such their opinions of the items. This cannot be far-fetched as most of them are administrators and would look for ways to improve the academic systems. They have also stayed long on the job and would look for ways to make their work easier and more qualitative. So, they are more open-minded.

H01: There is no significant difference in GAI knowledge usage among educator educators based on their years of experience

ANOVA for in GAI knowledge usage educator educators based on their year of experience

| | Sum squares | of df | Mean square | F | Sig. |
|-------------------|----------------|----------|-------------|------|------|
| Between groups | .146 | 2 | .073 | .347 | .708 |
| Within groups | 20.446 | 97 | .211 | | |
| Total | 20.592 | 99 | | | |

The p-value in Table 5 for all the items is greater than 0.05 level of significance therefore we fail to reject the hypothesis that "There is no significant difference in GAI knowledge usage educator educators based on their year of experience". The implication is that teaching experience does not

count in the perception of Chemistry educators about GAI acceptability.

Research question 3:

What are the perceptions of GAI among educators based on their gender?

Table 4: Descriptive statistics of Chemistry Educator's Perception of GAI based on their gender

| Gender | | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Item 8 | Item 9 | Item 10 | Item 11 | Item 12 |
|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|
| Female | Mean | 4.447 | 4.128 | 4.468 | 4.468 | 4.596 | 4.085 | 3.851 | 3.043 | 3.170 | 3.191 | 3.809 | 4.413 |
| | Std. D | 0.802 | 0.90 | 0.718 | 0.804 | 0.577 | 0.803 | 1.042 | 1.141 | 1.324 | 1.262 | 1.245 | 0.617 |
| Male | Mean | 4.283 | 4.170 | 4.283 | 4.472 | 4.377 | 3.962 | 3.755 | 3.075 | 3.094 | 3.264 | 3.547 | 4.453 |
| | Std. D | 0.885 | 0.753 | 0.632 | 0.608 | 0.627 | 0.733 | 0.897 | 1.141 | 1.131 | 1.243 | 1.048 | 0.749 |
| Total | Mean | 4.360 | 4.150 | 4.37 | 4.470 | 4.480 | 4.020 | 3.800 | 3.060 | 3.130 | 3.230 | 3.670 | 4.434 |
| | Std dev | 0.847 | 0.821 | 0.677 | 0.703 | 0.611 | 0.765 | 0.964 | 1.136 | 1.220 | 1.246 | 1.146 | 0.688 |

From table four above we could see a pattern between all the opinions as the mean and standard deviation infer that the opinions are in agreement. It also proves that the data is statistically accurate and valid. However, we are unable to justify that a particular gender performs better with GAI, this reason is justified by items 8,9,10 and 11 in which both gender mean is very

low and the standard deviation is very high. This shows a disparity in opinion and as such no visible difference between GAI acceptance between both genders.

H02: There is no significant difference in GAI usage among educator educators based on their gender

| | Sum squares | of df | Mean square | F | Sig. |
|-------------------|----------------|----------|----------------|------|------|
| Between groups | .096 | 1 | .096 | .460 | .499 |
| Within groups | 20.496 | 98 | .209 | | |
| Total | 20.592 | 99 | | | |

The p-value in Table 5 for all the items is greater than 0.05 level of significance therefore we fail to reject the hypothesis that "There is no significant difference in GAI knowledge usage educator educators based on their Gender". The implication

is that Gender does not count in the perception of Chemistry educators about GAI acceptability. Male and female educators are both interested in GAI, none is greater than the other.

Research question 4: What are the perceptions of GAI among educator educators based on their qualifications? Table4

| Qualification | | Item1 | Item2 | Item3 | Item4 | Item5 | Item6 | Item7 | Item8 | Item9 | Item10 | Item11 | Item 12 |
|---------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|---------|
| BSc (Ed.) | Mean | 4.500 | 3.900 | 4.700 | 4.200 | 4.500 | 4.000 | 3.900 | 2.700 | 2.800 | 2.800 | 3.700 | 4.800 |
| | Std. dev | 0.527 | 1.101 | 0.483 | 0.789 | 0.527 | 0.667 | 0.738 | 1.059 | 1.229 | 1.317 | 0.949 | 0.422 |
| BSc | Mean | 4.278 | 4.278 | 4.500 | 4.389 | 4.528 | 3.944 | 3.778 | 3.139 | 3.278 | 3.333 | 3.750 | 4.444 |
| | Std. dev | 0.849 | 0.513 | 0.609 | 0.549 | 0.506 | 0.754 | 0.797 | 1.073 | 1.137 | 1.242 | 1.131 | 0.809 |
| P.G.D.E. | Mean | 4.385 | 4.000 | 4.538 | 4.231 | 4.231 | 4.077 | 3.923 | 2.846 | 2.769 | 3.154 | 3.846 | 4.385 |
| | Std. dev | 1.121 | 1.000 | 0.519 | 0.439 | 0.832 | 0.862 | 0.954 | 1.068 | 1.235 | 1.068 | 1.144 | 0.506 |
| MSc. | Mean | 4.154 | 3.769 | 4.231 | 4.231 | 4.462 | 3.846 | 3.154 | 2.692 | 3.308 | 2.615 | 3.308 | 4.583 |
| | Std. dev | 1.435 | 1.166 | 1.301 | 1.166 | 0.660 | 1.143 | 1.405 | 1.378 | 1.548 | 1.387 | 1.437 | 0.515 |
| M.Ed. | Mean | 4.538 | 4.423 | 4.423 | 4.500 | 4.500 | 4.192 | 4.115 | 3.385 | 3.231 | 3.692 | 3.769 | 4.269 |
| | Std dev | 0.647 | 0.579 | 0.578 | 0.583 | 0.648 | 0.567 | 0.864 | 1.134 | 1.177 | 1.123 | 1.070 | 0.724 |
| Total | Mean | 4.360 | 4.470 | 4.470 | 4.370 | 4.480 | 4.020 | 3.800 | 3.060 | 3.130 | 3.230 | 3.670 | 4.434 |
| | Std. dev | 0.847 | 0.703 | 0.703 | 0.677 | 0.611 | 0.765 | 0.964 | 1.135 | 1.136 | 1.246 | 1.146 | 0.688 |

We can infer that those with qualifications in pure science may have issues from inculcating GAI, as the perception from this research seems to be very low. The only opinion in which their opinion is valid is item 6(AI tools may help educator educators to meet different needs in the classroom) with a standard deviation of 0.660 and a mean of 4.462 which is the only positive and relevant statistics to these context others are very close to the mean and show a high disparity. The same disparity in opinion can also be seen with PGDE. However, BSc (Ed) shows very positive results as the mean is very high and the standard deviation low for most of the items this in return b proves the necessity to employ qualified educators in the teaching profession. Their background has prepared them for most if not all of whatever need they may encounter and to always accept change. Med. can also be found in the same context with BSc (Ed) as most of its values show positive results with low standard deviation and high mean. These quantitative results can be complemented by the themes from the interviews with educators.

Pedagogical Content Knowledge

Based on the acquisition of the findings from Table 2 which shows a consensus among the responders regarding how GAI can influence the increase in educator educators' content knowledge with 51% strongly agreeing, 40% Agreeing making 90% on the positive side. There is only 6% are neutral, no one disagrees and only 6% strongly disagree. This finding shows that most educators believe that GAI would increase the content knowledge of educators. The mean score (4.360) followed by the standard deviation

(SD = 0.8471) further confirms this claim as it favours the effectiveness of AI tools as there is a disparity among the opinions. These claims can further be confirmed by statements of some educators in the open-ended questions extract:

"Broadens knowledge and simplicity."

"It gives both educators and students a broader view of concepts."

"Exploring more ideas"

"It makes educators to be curious about the originality of specific facts and also be aware of insufficiency"

Potential Challenges

Results from the analysis bring into the limelight the concerns of Gregorcic & Pendrill, as educators from their responses believe that GAI may affect the traditional approach necessary for the learning of students. The belief that GAI may affect established foundations needed for students learning science has always been a bone of contention. This claim is justified as 22% strongly agreed and 50% agreed to this recommendation. There were almost incognizant others as 16% were neutral, 10% disagreed and only 2% agreed. This was further confirmed by the mean score (3.800) and the Standard deviation (0.9640) which shows an agreement of opinions and less variability. An extract from the open-ended questions:

"It can lead to failure if not properly utilized"

"Most students will become independent learners, learning the wrong thing."

"Not allow students to read"

"Students may not concentrate and cooperate with the educator"

"It will make the students not listen or adhere to the teachings of the educator. It encourages laziness in educators and learners. It disallows critical thinking. It is not good for modern invention"

"It may go out of content from the local learning environment of learners"

"AI cannot be operations where meaningful apparatus is unavailable. It will also be a challenge especially where there is no skilled personality to handle such irrespective of the AI usage. Also, AI will necessarily give adequate exposure to the children in chemistry what they were to have been taught by their educator."

"The distraction of student by online content or other usage of the phone or gadgets."

Academic Achievement

Educator self-efficacy

Results from these findings bring to light the fear of educators, that AI could replace educators as students might rely on this technology. The reliance of students on AI can make educators lose their jobs or students no longer find their educator's lessons engaging or interesting enough. While 16% strongly agreed, 37% agreed, 7% were neutral, 34% disagreed and 6% strongly disagreed. The mean score is considerably moderate ($M = 3.230$) concern of educators, however, its standard deviation is very high (1.2460) this shows a disparity in results as some agreed while some disagreed. Educators' thoughts about this can also shed some light as seen below:

"It may lead to unemployment"

"Makes students lazy and reduces the use of textbooks"

"Students becoming independent of educators in the learning process."

"Difficulty in students' true/thorough assessment by the educator."

"The distraction of student by online content or other usage of the phone or gadgets"

"It will make the students not listen or adhere to the teachings of the educator."

"Most students will become independent learners, learning the wrong thing."

"Un-seriousness and distractions in the Classroom since the Students perceive they can get all the points the educator is sharing."

"Taking up the physical teaching job"

Training and Preparedness

The result from this finding brings to light a very strong agreement among the educators who participated in this study. The educator educators believed having adequate training for GAI would be of great benefit in its utilization in teaching the curriculum. This statement can be backed up by the data in the study in which 51% strongly agreed 42% agreed and 5% were neutral. Also, no participant disagreed and only 2% strongly disagreed. This result shows that there is a strong alignment in the results as the mean value $M(4.4)$ is high and a very low standard deviation(0.7654) this shows consistency in the result. Results from the interview questions with educators also reveal some thoughts below:

"Educators need to be trained on using AI very effectively in the teaching of Chemistry."

"Training educators and provision of adequate facilities"

DISCUSSION

This study revealed no significant difference in Chemistry educator perception of GAI between male and Female educators. This implies that the gender of the Science educator does not determine the possession of GAI knowledge or enthusiasm to teach it in teaching and learning. This means that Science educators perceive GAI the same way irrespective of gender. This result contradicted Kay, 2006, and Koh et al., 2010, who stated that there is a significant difference in usage of technologies by gender.

This result implies that science educators use TPCK for effective teaching with technology which helps in understanding the representation of concepts using technologies, pedagogical techniques that use technologies in constructive ways to teach content, knowledge of what makes difficult concepts easy to learn, and how technology can help correct some of the problems that students encounter. This result contradicted, Kay, 2006, Koh et al., 2010, Oz, 2015, Lin et al., 2013 who observed significance in gender favouring males and Martin (2011) thought that Female educators use technology for educational purposes while their male counterparts use it for entertainment.

The findings of this study show that there is no significant difference in Chemistry educator's

perceptions based on their years of teaching experience. While we were able to see some patterns in the descriptive analysis, we discovered that early career educators below 5 years have a low standard deviation and the highest teaching experience. This implies that the Genz educators are more conversant with GAI and are ready to use it. On the other hand, the administrators who make 10 10 years above group are very enthusiastic about this technology due to the ease of delivering their duties.

CONCLUSION

The findings of this study concluded that qualification and experience, year of experience, and gender do not significantly influence science educators' perception of GAI.

RECOMMENDATIONS

1. Schools should be equipped with the necessary equipment needed by educators for the utilization of GAI. Equipment like solar electricity systems, smart televisions, and tablets should be provided.
2. Educators should be equipped with skills that will enhance their in using GAI in the classroom
3. Strict rules should be made for educators to be technologically literate
4. Assistance with training should be given to educators by the Ministry of Education

Suggestion for further studies

1. Longitudinal research should be done with this research to monitor science educators' perception over a few years this will help elicit the right or intended behavior to be measured.
2. Future studies can improve on this study by using a larger educator population and by including educators in colleges of education, universities, polytechnics, or even primary school pupils to allow for generalization to include educators of different levels.
3. Other mediating factors such as the location of schools, home background, areas of specialization, work status and age of teachers (other than gender, experience, and qualification) which could account for the differential results should be studied

4. Replication of this study in Nigeria using other subject areas is recommended using this study as a basis and reference to further studies in this field or related publishing.

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