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Impact of Artificial Intelligent Class-Point on the Academic Achievement of Secondary School Students in Chemistry

B.G. Aregbesola,[1]

I.A. Ojelade[2]

S.B. Samuel3,[3]

[1]Department of Science & Environmental Education University of Abuja, Nigeria

[2]Department of Science & Environmental Education University of Abuja, Nigeria

[3]Department of Science & Environmental Education University of Abuja, Nigeria

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***Corresponding author:**
B.G. Aregbesola[1]; I.A. Ojelade[2] ; S.B. Samuel[3]

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Abstract

The study examined the impact of AI-Class-Point on the academic achievement of secondary school students in Chemistry. The target populations of this study comprised all students in public senior secondary schools II (SSII) in Ikene Local Government, Ogun State, Nigeria. The sample size for the study consists of one hundred and twenty students from two different town schools in the Local Government. The study used purposive sampling to select the two schools used for the study. The instruments used for data collection are Chemistry Academic achievement Test (CAT) from past WAEC questions. The validity of CAT items had already been established and deemed satisfactory as a standard test by WAEC validators. The reliability of the achievement test was determined using the split-half method and the reliability coefficient of 0.89. The data collected from the test was collated, scored and analyzed using mean and standard deviation to answer the research questions. T-tests at 0.05 level of significance was used to analyze the hypotheses for the acceptance of rejection. This study revealed that there was significant difference impact of AI-Class-Point on the academic achievement of secondary school students in Chemistry and those taught using the conventional method. Therefore, the study concluded that AI Class-Point improve students achievement in Chemistry and not gender bias. However, recommendations were made among others that AI Class-Point could be used to teach Chemistry concepts in secondary schools to enhance students' academic achievement.

Key words: Impact, AI-Class-Point and Academic Achievement.

Introduction

The education system in Nigeria, like many other countries, has undergone several reforms to

meet the evolving needs of the 21st century, and the government has implemented several policies to address challenges and improve the overall quality of education. The 6-3-3-4 system, which covers six years of primary education, three years of junior secondary, three years of senior secondary, and a minimum of four years of tertiary education, is the framework guiding the Nigerian education system. However, despite these efforts, challenges persist, especially in the effective integration of technology into the educational landscape. The secondary education system in Nigeria, catering to students aged 10 to 18, faces numerous challenges, including large class sizes, inadequate infrastructure, and limited access to modern educational resources Adewale et al [1]. The conventional chalk-and-talk methodology, while prevalent, may not fully engage students or provide an immersive learning experience, particularly in abstract subjects such as Chemistry.

Aregbesola, et al pointed that teaching science education is a driving force for changing the narratives of the society towards policy on job and labour engagement. While ensuring industrial revolution, strategic planning for innovation and creative society alleviate the task ahead, such as innovative strategy in teaching chemistry. Within the broader context of secondary education, the challenges in teaching Chemistry are notable. Chemistry, being a foundational science subject, demands a unique approach to instruction. Conventional teaching methods often rely heavily on theoretical lectures, limiting students' opportunities for hands-on experimentation and application of concepts[2]. Globally, technology has become a driving force in transforming education. Developed countries have embraced the integration of technology in classrooms, leading to enhanced learning experiences and improved educational outcomes. Digital tools, interactive whiteboards, online resources, and educational software have become integral components of modern education systems.

One of the latest technology is Artificial Intelligence (AI), it rapidly evolves fields that found applications across various sectors, and its integration into education holds immense potential to transform traditional teaching and learning methods. AI is also a cutting-edge technology that simulates human intelligence in machines, enabling them to perform tasks that typically require human cognitive functions. In education, AI has emerged as a transformative force, offering innovative solutions to long-standing challenges. AI applications in education range from intelligent tutoring systems and personalized learning platforms to automated grading and data analytics In 2000s, the intersection of AI and education has given rise to innovative tools and technologies aimed at enhancing the educational experience[3]. Artificial Intelligence refers to the development of computer systems capable of performing tasks that typically require human intelligence, such as problem-solving, natural language understanding, and pattern recognition. AI-powered educational tools contribute to the development of critical thinking skills, problem-solving abilities, and a deeper understanding of scientific principles .

The reliance on lecture-based approaches may not cater to the varied learning styles and preferences of students in 2020s beyond . Class-Point one of the AI tools introduces interactive elements into teaching chemistry concepts, which captures students' attention and fostering active participation. The ability to respond to polls and quizzes in real time transforms passive learning into an engaging and collaborative experience embedded into the tools . Also, laboratory sessions, an integral component of chemistry education, may be constrained by inadequate equipment, preventing students from gaining hands-on experience and practical skills [4]. AI Class-Point capabilities enable the customization of learning paths, by analyzing student responses, the tool can also identify individual learning preferences and adapt the presentation to cater to diverse needs. This personalized approach is conducive to effective learning in a subject as abstract as Chemistry .

Aregbesola, et al discovered that AI tools enhance science education and creates flexibility for teachers. Contrarily, Adegoke, et al revealed that teachers in rural communities faced significant challenges in effectively utilizing AI tools for science education. Factors such as limited access to technology, inadequate training, and infrastructure constraints identified as barriers to adoption. Despite these challenges, teachers expressed interest in incorporating AI into their teaching practices to enhance student-learning outcomes. AI has the potential to bridge educational gaps and improve academic achievement. Utilizing Class-Point in classroom instruction has demonstrated notable achievements in enhancing academic outcomes for both male and female students. Through its interactive features and multimedia capabilities, Class-Point fosters an engaging and dynamic learning environment that appeals to diverse learning styles and preferences. For male students, the interactive features of Class-Point activities often resonate positively, offering opportunities for hands-on involvement and immediate feedback. These aspects not only spark interest but also facilitate deeper comprehension and retention of intricate Chemistry concepts. Consequently, male students frequently display heightened levels of engagement and enthusiasm during Class-Point-enhanced lessons, resulting in enhanced academic achievement in Chemistry. Lestari, found that use of Class-Point interactive media in learning organic chemistry can increase knowledge and help in recalling the material studied and can also hone problem-solving skills and psychomotor abilities among students[5].

Studies suggest that male students often display a higher level of confidence and excitement regarding technology, readily embracing Class-point's interactive features with curiosity and eagerness . Empirical study found that using Class-Point tools could engage students at all levels of education and across all learning styles . Other research shows that using Class-Point as an interactive quiz tool increases student engagement and mastery of the material . Class-Point makes learning fun, easy, and interactive and keeps students excited, competitive, and

engaged. Research by Setiyanto and Wao, et al. regarding the use of Class-Point interactive media also provided positive student responses to the courses presented. Survey results conducted by Bong & Chatterjee, showed that more than 80% of student participants felt that Class-Point was an effective platform for encouraging student engagement and participation in class[6]. All instructor participants agreed that students tended to respond more frequently to interactive quizzes delivered through Class-Point than to answer verbally in class. In summary, research studies show that Class-Point can be an effective tool in increasing student engagement, subject mastery, and satisfaction with learning. Other research by Querido also shows that using Interactive Classroom tool or Class-Point as instructional materials can increase student participation and performance. Adesuagi, discovered that male students' achievement was higher than of female when taught Chemistry using AI Class-Point[7].

Also, Dugh, found that female enthusiastic was higher than that of the male when taught Chemistry using AI Class-Point. Likewise, female students derive significant benefits from the incorporation of Class-Point in classroom instruction. The interactive and multimedia components of Class-Point align with their visual and auditory learning preferences, enabling them to grasp abstract ideas more effectively[8]. Furthermore, the collaborative nature of certain Class-Point activities promotes peer interaction and communication, fostering a supportive learning environment where female students feel empowered to express their thoughts and pose questions. Consequently, female students often exhibit increased confidence and motivation in Chemistry classes where Class-Point is employed, leading to notable advancements in their academic achievements[9]. Overall, the successes observed in both male and female students when using Class-Point underscore its effectiveness in promoting active engagement, understanding, and success in Chemistry education Okeke, et al . The incorporation of Class-Point into classroom instruction may not only influences students' academic achievement but also shapes their gender perceptions towards learning achievement. When examining gender discrepancies towards Class-Point, it is crucial to explore how male and female students achieve with the use of technology and perceive its effectiveness in enriching their learning experiences[10]. Thus, it is necessary to carry out this study on the impact of AI-Class-Point on the academic achievement of secondary school students in Chemistry.

Research Questions

This research aims to seek answer to the following questions:

i. What is the impact of AI Class-Point, on the academic achievement of secondary school students in Chemistry?

ii. To what extent do differences exist between male and female students' mean achievement

scores taught chemistry using AI Class-Point?

Hypotheses

The following hypotheses were tested at a 0.05 level of significance:

H01: There is no significant difference impact of AI-Class-Point on the academic achievement of secondary school students in Chemistry and those taught using the conventional method.

H02: There is no significant difference between male and female students' mean achievement scores taught chemistry using AI-Class-Point[11].

Materials and Methods

The research design employed in this study was pre-test, post-test, control group quasi-experimental research. The choice of design corroborated with that of Ajai and Amuche, (2021) who submitted that schools disagreed with the rearrangement of students in their classes for research purposes, rather the used intact classes. The target populations of this study comprised all SSII students in public senior secondary schools in Ikene Local Government, Ogun State, Nigeria. The sample size for the study consists of one hundred and twenty students from two different town schools in the Local Government. The study used purposive sampling to select the two schools used for the study. The instruments used for data collection are Chemistry Academic achievement Test (CAT) from past WAEC questions, these items covered concepts relevant to the Chemistry topics for the specified class. Pre-tests and post-tests used to measure the students' achievement of Chemistry content. The validity of CAT items had already been established and deemed satisfactory as a standard test by WAEC validators. The reliability of the achievement test was determined using the split-half method and the reliability coefficient of 0.89. Thirty multiple objectives items test were administered to the students before and after treatment as pre- and post- test. The data collected from the test was collated, scored and analyzed using mean and standard deviation to answer the research questions. T-tests at 0.05 level of significance was used to analyze the hypotheses for the acceptance of rejection.

Results and Discussion

Research Question one: What is the impact of AI Class-Point, on the academic achievement of secondary school students in Chemistry?

Table 1: Mean and Standard deviation for Experimental and the Control Group

Group	No of Students	Mean Score	SD	Mean Gain

		Pre-test	Post-test		
Experiment	60	13.50	20.40	4.00	6.90
Control	60	12.98	14.70	4.40	1.72
Mean Difference		0.52	5.70		5.18
Total	120				

Table 1 reveals that the mean gain of the experimental group taught Chemistry concepts using AI Class-Point was 6.90 and those taught using conventional method was 1.72. The overall mean differences between the groups was 5.18 in favour of experimental group taught using AI Class-Point. This mean that the mean achievement of students taught Chemistry concepts using AI Class-Point was higher than those taught using conventional method having with higher mean gain difference of 5.18 in favour of the group taught with AI Class-Point, that is AI-Class-Point improved their understanding of Chemistry concepts[12].

Research Question Two: To what extent do differences exist between male and female students' mean achievement scores taught chemistry using AI- Class-Point?

Table 2: Mean and Standard deviation on Male and Female Mean Achievement Scores

Group	**No of Students**	**Mean Score**		**SD**	**Mean Gain**
		Pre-test	**Post-test**		
Male	32	13.50	24.10	4.57	10.60
Female	28	12.98	23.89	3.58	10.21
Mean Difference		0.52	0.21		0.39
Total	60				

The mean gain of the male in the group taught using Class-Point was 10.60 while that of female taught Chemistry concepts using Class-Point was 10.21.The mean difference between male and female students was 0.39, this mean that male and female students mean achievement taught with Class-Point are fairly the same with a slight difference[13].

Hypothesis

H01: There is no significant difference impact of AI-Class-Point on the academic achievement

of secondary school students in Chemistry and those taught using the conventional method.

Table 3: Two-tailed t-test Results of Mean Achievement Scores of Experimental and Control Groups

Group	Mean	SD	N	df	t-value	Std Error	p-value	Decision
Exp.	20.40	4.00	60					
				118	1212	0.1011	0.0000	Significant
Control	14.70	4.40	60					

Result in table 3 showed that there was significant difference impact of AI-Class-Point on the academic achievement of secondary school students in Chemistry and those taught using the conventional method. The mean score of the experimental group equal to 20.40 and that of the control group equal to 14.70,while p-value gave 0.0000 which showed significant (>.05), as a result, the hypothesis was not accepted[14].

H02: There is no significant difference between male and female students' mean achievement scores taught chemistry using AI-Class-Point.

Table 4: Two-tailed t-test Results of Mean Achievement Scores of Male and Female Students in Experimental

Group	Mean	SD	N	df	t-value	Std Error	p-value	Decision
Male	24.10	4.57	32					
				58	0.43	0.0311	0.5763	Not Significant
Female	23.89	3.58	28					

Result in table 4 showed that there was no significant difference between male and female students' mean achievement scores taught chemistry using AI-Class-Point. The male mean achievement score equal to 24.10 and that of female equal to 23.89 with difference of 0.21,

which was negligible[15]. The p-value gave 0.5763, which was higher than that of the significant level .05. Therefore, the null hypothesis was accepted which means that there was no significant difference between the mean achievement score of male and female students taught Chemistry using AI-Class-Point.

This study revealed that there was significant difference impact of AI-Class-Point on the academic achievement of secondary school students in Chemistry and those taught using the conventional method. The result corroborated with the study of Lestari, which stated that use of Class-Point interactive media in learning organic chemistry could increase knowledge and help in recalling the material studied and can hone problem-solving skills and psychomotor abilities among students[16]. This could be the result of AI Class-Point captures students' attention and fostering active participation. Also it abiliity to respond to polls and quizzes in real time transforms passive learning into an engaging and collaborative experience embedded into the tools [17]. However, utilizing Class-Point in classroom instruction has demonstrated notable achievements in enhancing academic outcomes for both male and female students. Through its interactive features and multimedia capabilities, Class-Point fosters an engaging and dynamic learning environment that appeals to diverse learning styles and preferences[18].

The study also showed that AI Class-Point could be used to increase students' academic achievement in chemistry, this upheld with other researchers who found the advantages of using Class-Point tools. Abdelrady & Akram, ; Lee, discovered that AI Class-Point could engage students at all levels of education and across all learning styles[19]. Other research showed that using Class-Point as an interactive quiz tool increases student engagement and mastery of the material . Class-Point makes learning fun, easy, and interactive and keeps students excited, competitive, and engaged. Research by Setiyanto and Wao, et al. regarding the use of Class-Point interactive media also provided positive student responses to the courses presented[20].

Conversely, this study revealed that there was no significant difference between male and female students' mean achievement scores taught chemistry using AI-Class-Point. In other words, gender has no significant impact on students achievements scores taught Chemistry using AI Class-Point. This could be indication that the use of AI Class-Point improved the achievement scores of both male and female post-test with negligible difference, which means AI Class-Point improved is not gender bias. Although, this contradicted that of Adesuagi, who discovered that male students' achievement was higher than of female when taught Chemistry using AI Class-Point due to clarity of calculative aspect of Chemistry[21]. Also, Dugh, found that female enthusiastic was higher than that of the male when taught Chemistry using AI Class-Point due to the visuals. Thus, this study has improved on both studies by

carefully input well-simplified mathematical aspect to breakdown difficult concepts and imbed simulated virtual to aid recall for the students. Thus, with improvement upon AI Class-Point this study discovered that there is no gender disparities among Chemistry students.

Conclusion

In light of the above findings from the study, it showed that AI-Class-Point improved the achievement of SSII students in Chemistry. In addition, the tools has revealed been gender friendly as no significant difference in the achievement of male and female students in secondary schools was found. This study submitted that AI Class-Point students achievement in Chemistry and not gender bias.

Recommendation

Based on the findings of the study, the following recommendations are made:

i. The AI Class-Point could be used to teach Chemistry concepts in secondary schools to enhance students' academic achievement.

ii. Since AI Class-Point has no gender disparity, it could be used to improve both male and female Chemistry students' achievement equally.

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