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EDITORIAL

Journal of Innovations in Science Education (JISE) is a Publication of Association of Science Educators Anambra (ASEA). It is publishable both online and offline. The publication is twice a year. It embraces only on science education and innovative ideas. JIES provide an avenue for dissemination of research findings, innovative ideas and practices between researchers, science educators and policy makers in the form of original research, book review, theoretical and conceptual papers which will serve as an important reference for the advancement of teaching, learning and research in the field of science education.

We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Josephine N. Okoli
Editor-in-Chief

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INFLUENCE OF INNOVATIVE TEACHING METHODS ON CHEMISTRY STUDENTS' ACHIEVEMENT IN SECONDARY SCHOOLS IN AWKA SOUTH LOCAL GOVERNMENT AREA ANAMBRA STATE NIGERIA

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Abstract

The study investigated the Influence of Innovative Teaching Methods on Chemistry Students' Achievement in Secondary Schools in Awka South Local Government Area, Anambra State Nigeria. The research design was descriptive survey research design. The study was guided by three research questions. The population of the study was 2,300 SS 1 Chemistry students. Simple random sampling technique was used to select 108 Chemistry students for the study. The instrument for data collection was a structured questionnaire titled "Effectiveness of Innovative Teaching Methods on Chemistry Students' Achievement in Secondary Schools" (EITMCSASS). The instrument was validated by experts. The reliability coefficient was established at 0.81 using test-retest method. Mean and standard deviation were used to answer the three research questions. The findings of this study revealed that innovative teaching methods were effective in enhancing the academic achievement and engagement of Chemistry students in secondary schools. The positive outcomes highlight the potential benefits of adopting these methods more widely in the education system. To address the challenges identified, the study recommended increased investment in teacher training, provision of adequate resources, and stronger support from school administrations and educational authorities. Finally, fostering a collaborative environment among educators and promoting the sharing of best practices can facilitate the effective adoption of innovative teaching strategies, ultimately leading to improved educational outcomes for students.

Keywords: Innovative Teaching Methods, Achievement, Chemistry,

Introduction

Education is the bedrock of societal development, and within the educational sphere, teaching methods play a crucial role in shaping students' learning outcomes (Hornby, 2020). In recent years, there has been a growing interest in innovative teaching methods, particularly in the field of Chemistry, due to their potential to enhance students' performance and engagement (Ajaja, 2023). Chemistry is the study of the composition, properties, synthesis and use of matter. Chemistry as a field of study is interested in how different substances react with one another and the suitable conditions for these reactions. The science of Chemistry is based on the study of atomic and molecular structure of matter to identify the properties of matter quantitatively and qualitatively (Obikezie, Nwuba, & Ibe, 2023). It probes into obtaining new beneficial products that can be used in medicine, agriculture, engineering and industry. Chemistry is also based on in treating some environmental problems such as rust, pollution of air, water and soil, the shortage of water and the energy resources. Since the ancient civilization, chemistry has been related to metals, mining, production of colours, medicine and some technical industries like tanning, dyeing clothes and production of glass (Ibe, Obikezie & Chikendu, 2021). The pharmaceutical industry is one of the most important applications of chemistry. All food consists of chemicals even if they are organically grown. Fuel and all parts of car are made up of chemicals. Dyeing of fabrics is a chemical process and chemical reactions are involved in the production of electricity. Water treatment and purification is an important chemical method. The study of chemistry is important for the scientific development of a nation and for economic growth. Chemistry is one of the science subjects studied in secondary schools in Nigeria. Chemistry, characterized by its compound concepts and nonrepresentational principles, often presents meaningful challenges to learners. Innovative teaching methods are base to bridgework the gap betwixt nonrepresentational noses and hardnosed application as well as thereby enhancing bowman engagement, understanding, and retention.

Innovative Teaching Methods

Innovative teaching methods play a pivotal role in shaping modern education paradigms. These methods are characterized by their departure from traditional instructional approaches and their emphasis on active student engagement and critical thinking (Hornby, 2020). Such methods aim to enhance students' learning experiences by fostering creativity, collaboration, and problem-solving skills. In the context of Chemistry education, innovative teaching methods encompass a wide range of

strategies designed to promote a deeper understanding and application of Chemistry concepts (Ajaja, 2023).

One common type of innovative teaching method is inquiry-based learning, which encourages students to explore scientific concepts through hands-on investigations and problem-solving activities (Jacinta, 2017). In Chemistry education, this approach often involves conducting experiments, making observations, and analyzing data to develop hypotheses and draw conclusions (Ibe et.al, 2021). By actively engaging students in the process of scientific inquiry, this method helps them develop critical thinking skills and a deeper appreciation for the scientific method (Jacinta, 2017).

Another innovative teaching method is cooperative learning, which involves students working together in small groups to achieve common learning goals (Ibe, Ezeliora & Okafor, 2024). In Chemistry education, cooperative learning activities may include group projects, collaborative research, and peer teaching exercises (Ibe, 2021). By promoting collaboration and communication among students, this method fosters a supportive learning environment and encourages the exchange of ideas and perspectives (Aniaku, 2022).

Concept mapping is another innovative teaching method commonly used in Chemistry education (Okoro, 2021). This approach involves visually organizing and representing complex information hierarchically, using concepts and their relationships to illustrate key ideas and connections (Ajaja, 2023). In Chemistry classrooms, concept mapping activities can help students visualize and organize their understanding of chemical concepts, facilitating deeper comprehension and retention (Gbadamosi, 2023).

Problem-based learning is yet another innovative teaching method that is widely used in Chemistry education (Aniaku, 2022). This approach challenges students to solve real-world problems or case studies by applying their knowledge of chemical principles and concepts (Lamidi, Oyelekan, & Olorundare, 2021). By engaging students in authentic, contextually relevant tasks, problem-based learning encourages critical thinking, problem-solving, and decision-making skills (Aniaku, 2022).

Additionally, mastery learning is an innovative teaching method that focuses on ensuring that all students achieve a predetermined level of mastery before progressing to more advanced topics (Ajaja, 2023). In Chemistry education, mastery learning may involve personalized instruction, formative assessments, and targeted interventions to address individual learning needs (Aniaku, 2022). By providing students with multiple

opportunities to master content at their own pace, this method promotes deeper understanding and long-term retention of chemical concepts (Ibe et.al, 2024).

Innovative teaching methods hold promise for addressing these challenges and improving Chemistry education outcomes. Aniaku (2022) investigated the effects of guided and unguided inquiry teaching methods on secondary school students, shedding light on potential strategies for enhancing student learning experiences. Similarly, Gbadamosi (2023) explored different teaching strategies in Oyo South Senatorial District, Nigeria, providing valuable insights into the effectiveness of various approaches. These studies underscore the importance of adopting innovative teaching methods to optimize student performance in Chemistry education. One key aspect of innovative teaching methods is their ability to foster student engagement and participation in Chemistry classes (Obikezie, et.al, 2023). By incorporating interactive and experiential learning activities, such as cooperative learning or concept mapping, educators can create dynamic learning environments that promote active student involvement (Ibe et.al, 2021). This not only enhances students' understanding of Chemistry concepts but also cultivates their interest and enthusiasm for the subject.

However, the successful implementation of innovative teaching methods is not without its challenges. Oyelekan, Igbokwe, & Olorundare, (2017) highlighted the importance of science teachers' utilization of innovative strategies in teaching senior school science, emphasizing the need for adequate training and support for educators. Additionally, Ajaja (2023) emphasized the role of supporting quality teaching in improving student learning outcomes, suggesting that effective professional development programs for teachers are essential for successful implementation. In Awka South Local Government Area, as in other regions, the adoption of innovative teaching methods requires careful consideration of contextual factors and resources. Similarly, Tebabal and Kahssay (2023) discussed the role of teacher initiation in online pedagogy, underscoring the importance of leveraging digital tools and resources to enhance teaching effectiveness. Despite these challenges, the potential benefits of innovative teaching methods in Chemistry education cannot be overstated.

In essence, education is indeed the bedrock of societal development, and innovative teaching methods play a vital role in shaping students' learning outcomes, particularly in the field of Chemistry. Awka South Local Government Area, like many other regions, faces challenges in ensuring effective Chemistry education delivery, highlighting the need for innovative approaches to enhance student performance and engagement. By leveraging evidence-based practices and addressing contextual

factors, educators can maximize the potential of innovative teaching methods to improve Chemistry education outcomes and contribute to the overall development of society.

Statement of the Problem

Traditional methods of teaching and learning are no longer responding to the needs of students nor increase their achievement and performance of students. Major stakeholders in education believe that using the traditional ways in teaching is the main reason of the backwardness, weakness, low interest and poor achievement of many students. Chemistry and Science students in general can only achieve their educational goal when there is provision of relevant resources, effective and efficient for their learning. Innovative teaching methods are of great help in fulfillment of teachers and students' educational needs. The use of new innovative teaching method in teaching and learning of Chemistry can make a difference in terms of school educational achievement and performance. Over the years there's been decline in the standard of Chemistry being taught in secondary schools. The standard is dropping on a regular basis, and it has affected the external examinations of students of Chemistry in secondary school. This has been greatly attributed to the poor usage of innovative method of teaching in the schools. Teachers' little knowledge to the use of innovative method in teaching and learning of Chemistry has also contributed to the decline in the standard of education. Majority of the teachers are novice to innovative method of teaching usage, thus affecting teaching and learning process. Therefore, it is against this background, the researcher wants to investigate the influence of innovative teaching methods in teaching and learning of Chemistry in secondary schools in Awka south L.G.A Anambra state, Nigeria.

Purpose of the Study

The purposes of this study are to;

1. Examine the influence of innovative teaching methods on the academic achievement of Chemistry students in secondary schools in Awka South Local Government Area.
2. Assess the extent to which innovative teaching methods influence students' engagement in Chemistry classes in Awka South Local Government Area.
3. Identify the challenges observed in the implementation of innovative teaching methods in Chemistry education within Awka South Local Government Area.

Research Questions

To guide this study, the following research questions were formulated:

1. What is the influence of innovative teaching methods on the academic achievement of Chemistry students in secondary schools in Awka South Local Government Area?
2. To what extent is innovative teaching methods influence students' engagement in Chemistry classes in Awka South L.G.A?
3. What are the challenges observed in implementing innovative teaching methods of Chemistry education in Awka South Local Government Area?

Methodology

The study adopted a Descriptive Survey Design and was carried out in secondary schools in Awka South L.G.A of Anambra state, Nigeria. The Population of the study comprises students in the secondary schools in Awka South L.G.A of Anambra state, Nigeria. A Sample of one hundred and eight (108) SS1 Chemistry students selected from the two secondary schools in Awka south L.G.A, Anambra state Nigeria was used. Purposive Random Sampling Technique was used to ensure a balanced representation of gender in intact groups. The Instrument was administered to the students with the help of research assistants from each of the participating secondary schools. A validated questionnaire titled "Effectiveness of Innovative Teaching Methods on Chemistry Students' Achievement in Secondary Schools " (EITMCSASS), designed by the researcher. The Reliability of the questionnaire was established before use. The questionnaire contained items on two different forms: firstly, four-point scale of Very High Extent (VHE = 4points), High Extent (HE = 3points), Low Extent (LE = 2points), Very Low Extent (VLE = 1point) four-point scale of Strongly Agree (SA = 4 points), Agree (A = 3 points), Disagree (D = 2 points) and Strongly Disagree (SD = 1 point). Mean and Standard deviation were used to answer the three research questions. The interpretation of the mean for the extent innovative teaching methods were used in the teaching and learning of Chemistry in secondary schools in Anambra state Nigeria was done using the real limit of numbers as follows; low extent (2.49 and below); moderate extent (2.50-3.49) and high extent (3.00-4.00). Moreover, any item with a mean rating of 2.5 and above indicated a positive response or agreement while items with mean rating of 2.49 and below indicated a negative response or disagreement.

Results

Research Question 1: What is the influence of innovative teaching methods on the academic achievement of Chemistry students in secondary schools in Awka South Local Government Area

Table 1: Mean and standard deviation of the influence of innovative teaching methods on the academic achievement of Chemistry students in secondary schools in Awka South L.G.A.

S/N	Item	SA	A	D	SD	Mean	Standard deviation	Remark
1	Innovative teaching methods have significantly improved my academic performance in Chemistry.	25	31	28	24	3.57	0.50	Agree
2	I believe that innovative teaching methods have positively influenced my understanding of Chemistry concepts	19	41	30	18	2.62	1.01	Agree
3	I feel more motivated to learn Chemistry when innovative teaching methods are used in class	23	34	26	25	3.17	0.82	Agree
4	I think that innovative teaching methods have contributed to better retention of Chemistry knowledge	25	32	27	24	3.34	0.57	Agree
	Overall Mean and Standard Deviation					3.18	0.73	Agree

The result in Table 1 reveals that all the items 1-4 were accepted as they were above the mean cut-off points of 2.50. This indicates that there is an impact of innovative teaching methods on the academic achievement of Chemistry students in secondary schools in Awka South Local Government Area.

Research Question 2: To what extent are innovative teaching methods influence students' engagement in Chemistry classes in Awka South L.G.A

Table 2: Mean and standard deviation of the extent innovative teaching methods influence students' engagement in Chemistry classes in Awka South L.G.A.

S/N	Items	VHE	HE	LE	VLE	Mean	Standard deviation	Remark
5	I actively participate in Chemistry classes when innovative teaching methods are employed	23	34	26	25	3.17	0.82	Moderate Extent
6	I find Chemistry classes more interesting when innovative teaching methods are used	23	34	28	23	2.58	0.92	Moderate Extent
7	I feel more engaged and focused during Chemistry lessons with the implementation of innovative teaching methods	28	30	26	24	3.61	0.54	High Extent
8	I believe that innovative teaching methods encourage collaborative learning among students in Chemistry classes	20	36	34	18	2.72	0.91	Moderate Extent
	Overall Mean and Standard deviation.					**3.02**	**0.80**	**Moderate Extent**

Data in Table 2 shows that all items 5-8 were to a moderate extent. Moreover, 3.02 and 0.80 were obtained as the overall mean score and standard deviation respectively. This indicates that innovative teaching methods influence students' engagement in Chemistry classes in Awka South L.G.A.

Research Question 3: What are the challenges observed in implementing innovative teaching methods in Chemistry education in Awka South Local Government Area

Table 3: Mean and standard deviation of the challenges observed in implementing innovative teaching methods in Chemistry education in Awka South L.G.A.

S/N	Item	SA	A	D	SD	Mean	Standard deviation	Remark
9	Lack of adequate training for teachers poses a challenge in effectively implementing innovative teaching methods in Chemistry education	25	31	28	24	3.49	0.55	Agree
10	Insufficient resources such as technology and teaching materials hinder the implementation of innovative teaching methods in Chemistry classes	24	32	28	24	3.33	0.47	Agree
11	Support from school administration and education authorities facilitates the successful implementation of innovative teaching methods in Chemistry education	22	34	28	24	3.17	0.82	Agree
12	Collaboration and sharing of best practices among teachers help in overcoming challenges associated with implementing innovative	25	36	24	23	3.00	0.73	Agree

	teaching methods in Chemistry education							
13	Resistance to change from traditional pedagogical methods to more innovative, technology-based teaching and learning methods by teachers and students	26	29	28	25	3.67	0.47	Agree
	Overall Mean and Standard Deviation					**3.33**	**0.61**	**Agree**

Table 3 reveals that all the items 8-13 were accepted as they were above the mean cut-off points of 2.50. This indicates that the challenges faced in implementing innovative teaching methods in Chemistry education in Awka South Local Government Area include: Lack of adequate training for teachers poses a challenge in effectively implementing innovative teaching methods in Chemistry education, Insufficient resources such as technology and teaching materials hinder the implementation of innovative teaching methods in Chemistry classes, Support from school administration and education authorities facilitates the successful implementation of innovative teaching methods in Chemistry education, Collaboration and sharing of best practices among teachers help in overcoming challenges associated with implementing innovative teaching methods in Chemistry education, Resistance to change from traditional pedagogical methods to more innovative, technology-based teaching and learning methods by teachers and students.

Conclusion

The study investigated the impact of innovative teaching methods in teaching and learning of Chemistry on students' academic achievement, engagement, and the challenges in implementing these methods in secondary schools in Awka South Local Government Area, Anambra State Nigeria. The findings provide a comprehensive understanding of the benefits and obstacles associated with modern pedagogical practices in teaching and learning of Chemistry. The findings have revealed that the innovative teaching methods enhanced students' understanding, achievement and retention in teaching and learning of Chemistry in secondary schools. Students exposed to these methods demonstrated improved academic achievement, highlighting the

potential of interactive and student-centered learning approaches to elevate educational outcomes. Secondly, the findings revealed a strong positive influence in the use of innovative teaching methods in teaching and learning Chemistry. The majority of students reported increased motivation, active participation, and greater interest in Chemistry when innovative teaching methods were employed. This suggests that such methods can enhanced student engagement, making learning more enjoyable and effective. The findings emphasize the importance of adopting teaching strategies that actively involve students in the learning process, thereby fostering a more dynamic and engaging educational environment.

Furthermore, the study explored the challenges faced in implementing innovative teaching methods. The results identified several obstacles, including inadequate training for teachers, insufficient resources, and lack of support from school administration. However, the study also highlighted facilitators such as collaboration among teachers and support from educational authorities. Addressing these challenges through targeted interventions, such as professional development programs, increased funding for educational resources, and fostering a supportive school culture, can enhanced the implementation of innovative teaching methods.

Finally, the study demonstrates the substantial benefits of innovative teaching methods in improving students' academic achievements and engagement in teaching and learning of Chemistry. The positive outcomes observed in the study advocate for a broader adoption of these methods in secondary schools. However, to fully realize these benefits, it is crucial to address the identified challenges. Providing adequate training and resources for teachers, along with strong support from school administrators and policymakers, is essential for the successful implementation of innovative teaching practices.

Recommendations

The recommendations suggested that;

1. Schools and policymakers should prioritize professional development for teachers to equip them with the necessary skills to implement innovative teaching methods effectively. Additionally, ensuring the availability of resources such as technology and teaching materials is essential for the successful application of these methods.
2. Fostering a collaborative environment among educators and promoting the sharing of best practices can facilitate the effective adoption of innovative teaching strategies, ultimately leading to improved educational outcomes for students.

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