AWARENESS AND UTILIZATION OF CUTTING-EDGE TEACHING STRATEGIES AMONG SECONDARY SCHOOL CHEMISTRY TEACHERS' IN ANAOCHA LOCAL GOVERNMENT AREA OF ANAMBRA STATE.

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Abstract

This study investigated the awareness and utilization of Cutting-edge teaching strategies among secondary school chemistry teachers in Anaocha Local Government Area (LGA) of Anambra State. The study adopted descriptive survey research design. Two research questions were raised to guide the study. The population of the study comprised all the thirty-five (35) chemistry teachers in the sixteen (16) public secondary schools in the LGA. The whole population was used for the study and so there was no sample and sampling technique. Questionnaire was the instrument used for data collection. Validation of the research instruments was carried out by three experts from the Department of Science Education, Department of Education Foundation and an experienced secondary school chemistry teacher. The reliability of the instrument was established using Cronbach Alpha which yielded a co-efficient value of 0.80. Data were collected through self-administered questionnaire by the researchers. Mean score and percentage was the statistical tools adopted for data analysis. Based on the findings of the study, it was discovered that chemistry teachers in Anaocha Local Government Area are aware of some of the cutting-edge teaching strategies such as flipped classroom, learning through storyline, project base learning among others but do not utilize them effectively. It was equally observed that the teachers are not aware of some of these teaching strategies such as Acrostic Letter Sentence Mnemonics, Reciprocal peer tutoring to mention but a few. Based on the findings, it was recommended among others that workshop, seminars and conferences should be organised for the Chemistry teachers and secondary school teachers in general for creation of awareness of cutting-edge teaching strategies for effective utilization. Adequate materials and equipment should be provided for effective utilization of these innovative teaching strategies. Chemistry curriculum should be revisited and readjusted to accommodate the use of cutting-edge teaching strategies.

Keyword: Cutting-edge teaching strategies, Awareness, Utilization, Chemistry Teachers

Introduction

Over the years, chemistry has been one of the subjects that students find difficult to understand due to its nature. It is an essential and core subject in the field of science. Chemistry is the study of matter. It is one of the three main branches of pure science. Chemistry is a science of discipline that deals with the study of composition, properties and uses of matter. Chemistry accommodates a variety of fields of study and is combined with other subjects to satisfy the senior secondary school examination (SSCE) requirements. Elizabeth (2023) defined chemistry as the study of matter, what it consists of, what its properties are and how it changes. It is concerned with the utilisation of natural substances and the creation of artificial ones like ionized water, plastics, perfumes, creams, potions, foods, drinks, etc Admission into university for a science related career such as medicine, engineering, nursing, pharmacy, architecture, agriculture, physical and biological sciences require a credit pass in chemistry in senior school certificate examination. The West African Examination Council Chief examiners report on students' performance in chemistry reveals that from 2020-2025 there are still calculation issues, practical weakness, difficulty in drawing structural formula in organic chemistry, theoretical misconceptions and failure to answer questions in direct relation to what is asked. (WAEC Chief Examiners 2020-2025)

The above report on continuous failure in Chemistry is an indication that all is not well with teaching and learning of the subject. Many researchers have delved into the chemistry teaching methods as one of the main reason for students' failure. For instance Adu-Gyamfi and Ageyi(2020) worked on Participatory teaching and Learning Approach : A framework for teaching redox reaction at high school level; Ezeanya, Odukwe and Egbutu, (2023)worked on effect of ethno-chemistry instructional approach on secondary school students' academic achievement and retention in chemistry in Idemmili -north local govt. area, Anambra state, Okwuduba (2018) studied the effect of teaching methods on students' academic performance in chemistry. The outcome of the research work by the above-mentioned authors showed that new innovative teaching methods introduced were more effective than the usual way of teaching and learning. Many of the above researchers believed that the use of the Cutting-edged teaching method increases achievement. In the research carried out by Arthur and Arthur (2017) titled the reason for Mass Failure in Secondary School Chemistry as a Result of Teaching Methods used by the Teacher; found out that over-reliance on lecture methods, lack of Practical activities and poor teacher- student interaction significantly contribute to students' poor performance in the subject. They recommended more student-teacher relationship, activity-based and cutting-edge teaching approaches to

improve learning outcomes

Cutting-edged teaching methods are the innovative /technological oriented teaching method that are expected to enhance teaching and learning. Shukla (2024) described cutting-edge teaching methods to include flipped classroom, gamification, inquiry –based learning and AR/VR technologies that make chemistry education more interactive and effective. Bugaje (2024) opined that Cutting-edge teaching method involves computer-aided instruction, analogy, concept mapping, cooperative learning and integrating AI and green chemistry principles. The Longing for academic achievement by both the teachers and students in the teaching and learning setting is very paramount. Teachers want to teach effectively for students to learn effectively and so they resort to cutting-edge teaching and learning strategies. Thompson (2021) opined that the purpose of introducing these new teaching strategies and methods is to improve academic outcomes and address real problems to promote equitable learning.

Some of the cutting-edge teaching methods are:

1. **Flipped classroom:** Thomas and Kumar (2024) describe flipped Classroom as a cutting-edge strategy in which teaching and learning continues at home after one-on-one interaction in the physical classroom/laboratories. New materials are being introduced to students outside class through reading, recording video instructions or other digital tools. The students will watch, and read the new knowledge sent to them at home. During class time different approaches will be introduced in order to digest the already sent materials through active learning such as cooperative group project, problem-solving activities among others. Flipped class room process is summarised as learn at home and practice in class pedagogy. This pedagogy is more applicable to science education that requires lots of experimental work which cannot be well assimilated without the theoretical knowledge.
2. **Personalized Teaching Strategy:** Personalized teaching takes care of what, when and how each student is being taught. Hu (2025) emphasises that traditional "one-size-fits-all teaching methods are no longer effective in meeting the diverse learners needs. It was found that personalised teaching significantly enhances achievement in contrast to traditional teaching strategies. Emphasis on designing instruction is no longer a one-way –traffic. Individual students' ability is considered while designing instruction. The ability level, learning pace and students' preferences are considered in the personal teaching strategy.
3. **Project – Based Teaching Strategy:** This is an instructional approach designed to give students the opportunity to develop knowledge and skills

through engaging in the projects set around challenges and problems they may face in the real world. Through collaboration with industries in teaching and learning, real world problems are being communicated to students for effective solution. (.Naseer et al., 2025)

4. **Inquiry – Based Learning:** Fabrianti and Ratnasari (2026) described inquiry-based teaching strategy as a student-centred instructional approach where learning is driven by questioning, investigation and discovery rather than direct teacher explanation. In inquiry-based teaching strategy, teachers who facilitates learning placed students at the centre of the learning. Students participate actively in inquiry base teaching strategy and are opportune to think critically.
5. **Jigsaws:** This method of teaching strategy involves sharing different aspects of a lesson topic to students who are already group in threes, fours etc based on the population of the students. They are given opportunities to be mastery of the aspect of the lesson give to them. They can now teach their peers accordingly. Moin et al., (2024), described Jigsaw strategy as a cooperative learning method where students are divided into groups and each member becomes as expert on a portion of the topic which will taught to other members.
6. **Technological-integrated/Blended Teaching strategy:** In this strategy, combination of the traditional classroom and technologies such as Virtual reality, Learning Management systems, Gamification and online Platform are used during teaching and learning process. Chauhan and Parijar (2025) depict that the teaching strategy promotes interactive and immersive learning, encourages students' engagement and motivation. They opined that it equally supports flexible learning i.e. online face to face learning.

Awareness and utilization of the above cutting-edge teaching strategies in the chemistry classrooms and Laboratories is another ball game. Faruk (2025) revealed a low level of awareness among the chemistry teachers regarding the use of artificial Intelligence(AI) tools in teaching and learning despite recognising their potential benefits. Okongwu and Ogu (2024) who worked on constructive-base teaching strategies found out that chemistry teachers' qualifications and experience influence their utilization of the strategy in teaching and learning. Many chemistry teachers may be aware of some of these cutting-edge teaching strategies but may be handicapped in utilizing them. There are many theoretical frameworks that backed the use of cutting –edge teaching strategies.

One of the most applicable theoretical framework that support cutting-edge learning strategy is Constructivist Learning Theory by Vygotsky (1978). The theory

depicts that learners construct Knowledge through active engagement and social interaction. Here learners construct their own understanding and knowledge of things around them actively through experiences and they equally ponder on those experiences. The learning theory does not view learning as a passive assimilation of information but an active social means of being informed. The mental engagement of students in manipulating ideas, testing hypotheses and reconciling novel information with their prior knowledge leads to the occurrence of deep and lasting learning. In a Virtual and Simulation laboratory for instance, the theory is of the view that students will be allowed to manipulate variables at atomic or molecular level. They can equally see gas particles moving very fast at temperature increase. These scenarios are not possible in a physical class. The theory emphasises that cutting –edge teaching strategy has transited teaching and learning from imagination to reality.

The use of cutting-edge teaching strategies in chemistry classrooms and Laboratories cannot be overemphasized. Many researchers have investigated on these innovative teaching strategies and had recorded positive outcomes on their use in classrooms and laboratories. One may ask, how many of the secondary school chemistry teachers in Anaocha LGA are aware of these cutting-edge teaching strategies? How many of them who are aware have ever introduce and utilize them in their classroom and laboratories? The study therefore sought to determine if the secondary school chemistry teachers in Anaocha LGAs are aware of the cutting-edge teaching strategies. The study will equally seek to determine the extent these teaching strategies has been utilized by chemistry teachers.

Research question

The following research questions guided the study

1. What is the level of awareness of cutting-edge teaching strategies among secondary school chemistry teachers in Anaocha LGA?
2. To what extent do secondary school chemistry teachers in Anaocha LGA utilize cutting-edge teaching strategies in their classrooms?

Methodology

Descriptive Survey research design was adopted by the researchers and the area of the study was Anaocha Local Government Area, Anambra State. The population of the study comprised all the thirty-five (35) chemistry teachers in the sixteen (16) public secondary schools in the LGA. The whole population was used for the study and so there was no sample and sampling technique since the population was few. The instrument for data collection was a structured questionnaire titled Awareness

and Utilization of Cutting-edge Teaching Strategies (AUCTS). The validation of the instrument was done by three experts, two were from the Faculty of Education Nnamdi Azikiwe University Awka while the third validator was an experienced secondary school chemistry teacher. Cronbach Alpha reliability test was used and the coefficient of 0.74 was obtained. The researchers personally administered the questionnaire to the respondents and collected them on the spot. Four (4) point Likert scale of Highly Aware (HA), Moderately Aware (MA), Slightly Aware (SA) and Not Aware (NA) was used to answer the research question one while the research question two was answered by the four-point Likert Scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). HA/ VHE has 4point, MA /HE has 3points, SA/ LE has 2points while NA/ VLE has 1point. The data collected was analysed using mean and percentage.

Points 1, 2, 3 and 4 were the weights that show the strength of their responses, 2.5 served as a baseline. In taking decision for the research questions, a mean score of 2.50 or 62.50% and above is regarded as positive and in agreement with the statement while a mean rating below 2.50 or 62.50% is negative and in disagreement with the statement by the respondents.

Results

Research Question 1: What is the level of awareness of cutting-edge teaching strategies among secondary school chemistry teachers in Anaocha LGA? 5.7.14,20,60

Table 1: Mean and percentage rating of respondents on the level of awareness of cutting-edge teaching strategies among secondary school chemistry teachers in Anaocha LGA?

S/N	ITEMS	TOTAL	N	X	%	REMARK
1	I am aware of flipped classroom teaching strategy	38	35	1.08	27	Disagreement
2	I am aware of the use of Reciprocal Peer Tutoring teaching strategy	26	35	0.74	19	Disagreement
3	I am aware of the Project-based teaching Strategy	135	35	3.85	96	Agreement
4	I am familiar with Instructional Analogy based learning (IAL)	110	35	3.14	78	Agreement

5	I am aware of personalized learning strategy	117	35	3.34	83	Agreement
6	I am familiar with inquiry-based learning strategy	114	35	3.26	81	Agreement
7	I am aware of Acrostic Letter Sentence Mnemonic teaching strategy	52	35	1.48	50	Disagreement
8	I am aware of computer-based teaching strategy	108	35	3.09	77	Agreement
9	I am aware offield trip teaching strategy	114	35	3.26	81	Agreement
10	I am aware of concept mapping teaching strategy	121	35	3.46	86	Agreement
	Cluster Mean			2.67	67	

In the table 1 above, the cluster Mean of 2.67 and the percentage of 67 shows that majority of the chemistry teachers in Aniocha LGA are away of the existence of some of the cutting-edge teaching strategies. Majority of them agree that they are aware of the existence of project-based teaching strategy, Instructional Analogy base learning, personalized learning teaching strategy, inquiry-based teaching strategy, computer-based teaching strategy, field-trip based teaching strategy and concept map teaching strategy. There was a disagreement in the awareness of the following teaching strategies by the teachers: Flipped classroom, Reciprocal Peer Tutoring, and Acrostic Letter Sentence Mnemonic They are very strange to them and so they have lowest percentages and mean.

Research question 2: To what extent do chemistry teachers in Anaocha LGA utilize cutting-edge teaching strategies in their classrooms?

Table 2: Mean and Percentage ratings of respondents on the extent chemistry teachers in Anaocha LGA utilize cutting-edge teaching strategies in their classrooms?

S/N	ITEMS	Total	N	X	%	Remark
11	I make use of flipped classroom teaching strategy	35	35	1.00	25	Disagreement
12	I teach using the Reciprocal Peer Tutoring teaching strategy	39	35	1.11	28	Disagreement
13	I teach my students with Project-based teaching Strategy	110	35	3.14	79	Agreement

14	I use Instructional Analogy based learning (IAL) to impact knowledge to my students	57	35	1.62	41	Disagreement
15	I use personalized learning strategy in my class	74	35	2.11	52	Disagreement
16	I teach my students with inquiry-based teaching strategy	78	35	2.22	56	Disagreement
17	I teach my students with Acrostic Letter Sentence Mnemonic strategy	52	35	1.48	50	Disagreement
18	I make use of computer-based teaching strategy	69	35	1.97	49	Disagreement
19	I use field trip teaching strategy for students	92	35	2.63	65	Agreement
20	I teach my students with concept mapping teaching strategy	85	35	2.43	60	Disagreement
	Cluster mean			1.97	49.2	

In the table above, the cluster Mean of 1.97 and percentage of 49.2 indicate that majority of the chemistry teachers in Anaocha LGA do not use the cutting-edge teaching strategy. Out of the ten (10) cutting-edge teaching strategy in the table 2, there is agreement in the use of only project-based, and field trip strategies by the teachers. There is no agreement in the use of Flipped-classroom, Reciprocal Peer Tutoring, Instructional analogy, Acrostic letter Sentence Mnemonic, computer-based instructional strategies, personalised instruction, Inquiry-Based and concept mapping teaching strategies. This implies that the Secondary school chemistry teachers in Anaocha LGA do not use them during teaching and learning or that the use is not significant.

Discussion of findings

Table one x-rays the level of awareness of cutting –edge teaching strategies by chemistry teachers in Anaocha LGA. It was observed that they are moderately aware of project-based instructional strategy, instructional analogy teaching strategy, personalized teaching strategy, computer-based teaching strategy, concept mapping teaching strategy, field trip teaching strategy and inquirybased teaching strategy. This is in line with the findings of Adesoji and Ibrahim (2020) in the research work chemistry teachers' awareness and utilization of innovative teaching strategies in Osun State, Nigeria. They found out that Nigerian Chemistry teachers are highly aware of the cutting-edge teaching strategies such as collaborative learning, problem-based learning and the use of simulation. Equally in the work

carried out by Chandrasegaran , Treaust and Mocerin (2021) on teachers' awareness of multiple representations in chemistry education and integration in their classroom practice, it was found that experience chemistry teachers have strong awareness of the importance of multiple representation as a core research-based strategy for teaching chemical concepts. The present research work portrays that chemistry teachers in Anaocha LGA are not aware of the Acrostic letter sentence Mnemonics, Reciprocal peer tutoring and Flipped-classroom teaching strategies.

Table 2 showcased the extent of utilization of cutting-edge teaching strategies by the chemistry teachers in Anaocha LGA . It was equally found out that the extent of utilization of some of the known cutting-edge teaching strategy by the chemistry teacher in the LGA was at a very low extent. For instance, chemistry teachers in Anaocha LGA are moderately aware of instructional analogy, Personalised instructions, inquiry base, field trip and concept mapping teaching strategies but the extent of utilization of the teaching strategies were very low. This is in line with the research work by Eilks and Hofstein (2015) on the research topic; from Theory to Practice. It was found that despite the widespread awareness of inquiry-based learning among chemistry teachers, it implementation in the classroom/laboratories is very low. The implementation was not possible as a result of large class sizes, rigid curricular, lack of time and insufficient professional development. This might be the cause of poor implementation of the cutting-edge teaching strategies in the present research work though the reason for the poor implementation is not included in the scope of the present study. Equally, in the research work; unpacking the barriers to technology integration in chemistry classrooms by Lamb and Akmal (2021), the research confirms that awareness of educational technology tools is high, but practical integration is low.

Conclusion

Conclusively, cutting-edge teaching strategies are not far-fetched from the chemistry teachers in Anaocha LGA. Most of the teachers are aware and familiar with the method. This is why the level of awareness of many of the teaching strategies is high. Equally the research work depicts that there is some cutting-edge teaching strategy their level of awareness by the chemistry teachers is still very low. However, awareness of cutting-edge teaching strategies among secondary chemistry teachers in Anaocha LGA is generally not the only issue. Another problem which seems to be the straw that broke the Carmel back is the lack of implementation of the known teaching strategies in the chemistry classroom/laboratories.

In the present studies, the extent of implementation of these cutting-edge teaching strategies is very low. This is mainly as a result of lack of awareness of the

existence of such teaching strategies. Other factors might equally contribute to that. However, teachers are very adamant in trying new things. Most of them are very comfortable with the usual way of teaching despite the negative consequences.

Recommendations

Based on the findings from the study, the researchers made the following recommendations:

1. Ministry of Education and the Post-primary school management should collaborate in organizing workshops, seminars, symposiums and conferences on the existence of cutting-edge teaching strategies and how they can be utilizing during teaching and learning
2. Teachers should be encouraged and supported to disposed themselves to try new ways of teaching and learning.
3. Adequate facilities should be available in schools which will make the use of this new innovative teaching and learning possible.
4. Curriculum planers should equally adjust and readjust the chemistry curriculum to be able to accommodate or be in line with the use of cutting-edge teaching strategies for effective teaching and learning.
5. Schools should be adequately financed by the government to enable them procure the necessary equipment needed for the implementation of cutting –edge teaching strategies.
6. The school management should look into the class size of his/her school to avoid overcrowded classes that do not usually give room for effective use of the cutting-edge teaching strategies.
7. Computer-based instructional strategy, Flipped-classroom strategy and other technological teaching strategies needed power supply for its effective use and so steady power is highly needed for the actualization of the dream of teaching and learning with cutting-edge teaching strategies.

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