

Chemistry Teachers And Utilization Of Constructivist-Based Teaching Strategies In Senior Secondary Schools In Onitsha Education Zone

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Abstract

Constructivist-based teaching strategy could be considered one of the effective teaching strategies. This work investigated the issues surrounding the Chemistry teachers' utilization of constructivist-based teaching strategies in senior secondary schools. The study employed descriptive survey research design. The population comprised all the 98 chemistry teachers in all the 32 government owned secondary schools in Onitsha Education zone. No sampling was done. All the 75 female and 23 male teachers in the zone formed the sample. The instruments were Observation Rating Scale and Questionnaire titled Chemistry Teachers' Utilization of Constructivist-based Strategies Questionnaire (CTUCSQ). 4 research questions and 3 hypotheses guided the study. Means and standard deviations were used for the research questions while Z-test was used to test the hypotheses at 0.05 alpha level. The results show that teachers use constructivist-based teaching strategies at seldom. Also, there is a significant difference in the use of constructivist-based teaching strategies with regards to the teachers' qualifications. But no significant difference was found on the utilization of the strategies with regards to gender. Recommendations were made with calls on teachers' associations to reflect these strategies in their conference, workshop and seminar themes and sub-themes.

Key Words: *Constructivism, Teachers, Utilization, Strategy and Chemistry*

Introduction

Science is an indispensable instrument for societal development. Science encompasses the exploration and utilization of knowledge to comprehend both natural and social phenomena through a structured evidence-driven approach. Contemporary advancements in technology heavily rely on modern science as foundation. Numerous breakthroughs enhancing human life were made possible through the application of scientific knowledge. It therefore becomes pertinent that science subjects can be taught at all levels of education.

Chemistry is the study of matter, its characteristics, how and why compounds interact with energy and how matters combine or separate to generate new substances. Ikokwu and Egolum

(2020) opined that chemistry has a key role to play in understanding everything from viral structure to pathogenesis, isolation of vaccines and therapies, as well as in the development of materials and techniques used by basic researchers, virologists, and clinicians. Chemistry is the cornerstone of scientific literacy. The fact that Chemistry acts as a bridge between nearly all the science subjects and a wide range of other human endeavors makes it necessary to be studied in schools.

However, despite the importance of Chemistry, students' achievement in the subject has been very poor (Igboanugo, 2013). This may be due to lack of the use of innovative teaching strategies that could facilitate greater interaction in teaching of Chemistry.

The poor academic achievement in Chemistry could be attributed to many factors, among them is teachers' use of inappropriate teaching strategies or inability to use constructivist based teaching strategies. Researchers have blamed the poor achievement and performance of students in sciences especially Chemistry on the use of inappropriate teaching strategies which might lead to lack of interest and retention of concepts. Researchers' and studies have suggested the use of activity-driven strategies such as guided-inquiry, cooperative learning, demonstration, think and do, use of analogy and many others to ensure result-oriented Chemistry delivery in schools. This is supported by constructivist learning theory which states that learning is an active process where learners are able to form new ideas based on what their current knowledge is as well as their past knowledge using their cognitive structure. Studies and researches agreed with the above statement by stating that students achieve better when teachers utilize student centered strategies or constructivist based teaching strategies. Constructivist based teaching is a proactive approach to integrate new teaching strategies and methods into the classroom teaching and learning process. The primary motive of constructivist based teaching is encouraging students to engage more in the learning process. When students interact with teachers and peers, they gain more practical experience and retain more information from a class. A teaching strategy is a carefully designed classroom interaction that could be meticulously followed to teach a concept, topic or an idea. Despite the importance of these constructivist based teaching strategies many science teachers do not seem to use it in their classrooms. However, one of the major problem or reasons for the above could be teachers' educational qualification which could be one of the factors for good delivery of lessons in the classroom. Professional development can no longer be viewed as an event that occurs in a particular day

of the year rather it must be the accumulation of the daily work experiences of the educators. Teaching as a profession is that which requires the acquisition of knowledge in specialized teacher-training education institutes such as colleges of education and universities for effective and successful practice. A qualified teacher is one who holds a teaching qualification and/or licensed by the state, possesses at least a bachelor's degree from a degree awarding university and is qualified in her area of specialization (Musau and Abere, 2015). According to Akinsolu (2010) the availability of qualified teachers determined the achievement of students in school. Yala and Wanjohi (2015), found that teachers' educational qualifications are the prime predictors of students' academic achievement. Hence, the need for this study to find out the influence of Chemistry teachers' qualification on utilization of constructivist based teaching strategies in Onitsha Education Zone of Anambra State. Another factor that could be responsible for teachers' utilization of constructivist based teaching strategies is the teachers' teaching experience.

The experience of the teacher may help him to cope and adapt to changes in educational programs and emerging pedagogies. Teachers are said to gain extensive experiences of successful and unsuccessful performances throughout their years of teaching. This assumption generated an in-depth research into how teachers who have been involved in teaching for different periods of time perceive their teaching and how they affect learning.

Mensah and Nabie (2021) observed that teachers with long experience use better classroom management approaches and adequate teaching methods that encourage students' autonomy and reduce teacher control, thus taking responsibility for students learning needs, managing classroom problems and keeping students on tasks. In addition to teaching qualification and experience, Ewatan and Ewetan (2014) pointed out that

another characteristic of the teachers that scholars found to have influence on utilization of constructivist based teaching strategies is gender. Gender simply means the character or characteristics of being male or female, man or woman, boy or girl. Studies shows that gender has no significant influence in teachers' utilization of constructivist based teaching strategies (Ajaja 2013). Also, Zacharia(2017), in a study revealed that teachers' gender has influence on students' academic achievement as the students perform better when taught by the male teachers. Finally, from these studies, there is no conclusive statement on teachers teaching qualification, experience, and gender related issues, investigated by the researchers and the studies cited above. As such, this study seeks to assess the influence of Chemistry teachers' qualifications, years of experience, and gender on their utilization of constructivist based teaching strategies. Hence, the need for this study to assess the Chemistry teacher's utilization of constructivist based teaching strategies for teaching secondary schools in Onitsha Education Zone of Anambra State.

Research Questions

The following Research questions guided the Study

1. To what extent do Chemistry teachers utilize constructivist based teaching strategies in teaching Chemistry?
2. What is the influence of Chemistry teachers' qualifications on utilization of constructivist based teaching strategies in teaching Chemistry?
3. What is the influence of Chemistry teachers' years of experience on utilization of constructivist based teaching strategies in teaching Chemistry?
4. What is the influence of gender on Chemistry teachers' utilization of constructivist based teaching strategies in teaching Chemistry?

Hypotheses

The following null hypotheses were formulated to guide the study. The hypotheses were tested at 0.05 level of significance.

Ho₁: Chemistry teachers' qualifications have no significant influence on their utilization of constructivist based teaching strategies in teaching Chemistry

Ho₂: Chemistry teachers' years of experience have no significant influence on their utilization of constructivist based teaching strategies in teaching Chemistry.

Ho₃: There is no significant difference between the mean rating scores of male and female Chemistry teachers on their utilization of constructivist based teaching strategies in teaching Chemistry.

Methodology

The study adopted a descriptive survey research design. The population of the study comprises 98 Chemistry teachers in all the 32 public secondary schools in Onitsha Education Zone. This consists of 23 male and 75 female Chemistry teachers. Out of the 32 secondary schools, 19 are co-educational and 13 are single sex schools. The sample for the study consisted of all the ninety-eight (98) Chemistry teachers in the Onitsha Education Zone. No sampling was done. All the Chemistry teachers were used. The instrument for data collection was an Observation rating scale and questionnaire titled "Chemistry Teachers' Utilization of Constructivist-based Strategies Questionnaire (CTUCSQ)" developed by the researcher. The instrument consists of two sections (A and B). Section A gathered demographic data on teachers' qualifications, years of experience and gender, while Section B included 10 items related to the utilization of constructivist-based teaching strategies. The mean score interpretation for research question one was based on real limit numbers, categorizing mean scores of 3.50-4.50 implies *Very High Extent (VHE)*, 2.50-3.49 implies *High Extent (HE)*, 1.50-2.49 implies *Low Extent (LE)* and

0.50-1.49 implies *Very Low Extent (VLE)*. Z-test was used in testing the research hypotheses. SPSS version 20 was used. Teachers with 0-9 years of experience were considered less experienced, while those with 10 years and above were classified as highly experienced. Similarly, teachers without educational qualification were labeled as less qualified, and those with educational qualification were classified as highly qualified. The instrument was validated by specialists from colleges of education and universities. Trial testing involved twenty(20) Chemistry teachers from Aguata Education Zone, and a reliability value of 0.83 was obtained using Cronbach Alpha reliability estimate to determine the internal consistency and reliability of the instrument.

The answers to the research questions utilized mean and standard deviation, while z-test was employed for addressing the research hypotheses. The research design aimed at exploring the influence of Chemistry teachers' qualifications, years of experiences and gender on the utilization of constructivist-based teaching strategies among senior secondary school students in Onitsha Education Zone.

Research Question One:

To what do Chemistry teachers utilize innovative teaching strategies?

Table1: Mean score and standard deviation of Chemistry teacher's utilization of innovative teaching strategies in teaching Chemistry.

Innovative Based Teaching Strategies	Mean	Standard Deviation	Decision
Problem Solving Based Teaching	2.41	0.12	LE
Cooperative Based Teaching	2.62	0.08	HE
Demonstration Based Teaching	2.32	0.06	LE
Project Based Teaching	2.64	0.07	HE
Computer Assisted Based Teaching	1.75	1.02	LE
Peer Tutoring Based Teaching	1.87	0.83	LE
Power Point Presentation Based Teaching	2.21	0.84	LE
Study Aid Based Teaching	2.47	0.82	LE
Guided Discovery Based Teaching	2.79	0.72	HE
Peer Lead Tutoring Based Teaching	2.38	0.99	LE

The result in table1 shows that items 2, 4, and 11

have mean scores of 2.50 and above showing high extent to which Chemistry teachers utilize various innovative teaching strategies. While items 3, 5, 6, 7, 8, and 10 have means of 2.49 and below showing low extent, which implies that Chemistry teacher's utilization of the various innovative teaching strategies is to a low extent.

Research Question Two

What is the influence of Chemistry teachers' qualification on utilization of constructivist based teaching strategies?

Table 2: Mean score and standard deviation on the influence of Chemistry teacher's qualification on utilization of constructivist based teaching strategies.

Qualification	N	Mean	SD
Highly qualified	60	2.50	0.60
Less qualified	38	1.93	0.21

Result in table 2 shows that highly qualified teachers have mean score of 2.50 and standard deviation of 0.60, while the less qualified teachers have mean score of 1.93 and standard deviation of 0.21. This means that the highly qualified teachers utilize constructivist based teaching strategies than the less qualified teachers.

Research Question Three

What is the influence of Chemistry teacher's experience on utilization of constructivist-based teaching strategies?

Table 3: Mean score and standard deviation on influence of Chemistry teachers' experience on utilization of constructivist based teaching strategies

Experience	N	Mean	SD
Highly Experience	52	2.31	0.39
Less Experience	46	2.21	0.57

The result in table 3 reveals the mean score of highly experienced and less experienced teachers on utilization of constructivist-based teaching strategies. The highly experienced teachers had a mean score of 2.31 and standard deviation of 0.39, while the less experienced teachers had a mean score of 2.21 and standard deviation of 0.57. This shows that the highly experienced teachers had a higher mean score on utilization of constructivist based teaching strategies than the less experienced teachers.

Research Question Four

What is the influence of gender on Chemistry teacher's utilization of constructivist-based teaching strategies?

Table 4: Mean score and standard deviation on Chemistry teachers' ratings in their utilization of constructivist based teaching strategies based on gender.

Gender	N	Mean	SD
Male	23	2.52	0.67
Female	75	2.20	0.52

Result in table 4 shows that male teachers had a mean score of 2.52 and standard deviation of 0.67 while the female counterpart had a mean score of 2.20 and standard deviation of 0.52. This reveals that the male teachers have higher mean score than their female counterpart on utilization of constructivist-based teaching strategies.

Hypothesis One:

Chemistry teachers' qualifications have no significant influence on their utilization of constructivist based teaching strategies in teaching Chemistry.

Table 6: z-test analysis of the significant difference between the mean rating scores of highly qualified teachers and less qualified teachers on their utilization of constructivist based teaching strategies.

Variable	N	X	SD	z-val	Df	p-val
Highly qualified	60	2.50	0.60	4.398	51	.000
Less qualified	38	1.93	0.21			

Result presented in table 6 shows that the z-value of 4.398 with associated probability value of .000 at 51 degree of freedom was obtained. The difference was found to be significant. Thus, the null hypothesis of no significant difference is rejected. This implies that teachers' qualification has significant influence on their utilization of constructivist based teaching strategies.

Hypothesis Two

Chemistry teachers' years of experience have no significant influence on their utilization of constructivist based teaching strategies in teaching Chemistry

Table 7: Z-test analysis of the significant difference between the mean rating scores of highly experienced teachers and less experienced teachers on their utilization of constructivist based teaching strategies.

Variable	N	X	SD	z-val	Df	p-val
Highly experienced	52	2.31	0.39	.678	51	.501
Less experienced	46	2.21	0.57			

The result in table 7 showed that the z-value of 0.678 with associated probability value of .501 at 51 degree of freedom was obtained. Therefore, the null hypothesis of no significant different was not rejected since the p-value (.501) is greater than 0.051 level of significant. This implies that, teachers' experience has no significant influence on their utilization of constructivist based teaching strategies.

Hypothesis Three:

There is no significant difference between the mean rating scores of male and female Chemistry teachers on their utilization of constructivist based teaching strategies in teaching Chemistry.

Table 8: Z-test analysis of the significant difference between the mean rating scores of male and female teachers in their utilization of constructivist based teaching strategies.

Variables	N	X	SD	z-val	Df	p-val
Male	23	2.52	0.67	1.529	51	.132
Female	75	2.20	0.54			

The result in table 8 revealed that z-value of (1.529) with associated probability value of (.132) at 51 degree of freedom was obtained. Thus, the null hypothesis of no significant difference is not rejected since the probability value of (.132) is greater than 0.05 level of significant. The researcher therefore concludes that gender has no significant influence on Chemistry teachers utilization of constructivist based teaching strategies.

Discussion of the findings

The findings of the study revealed that Chemistry teachers utilize model based, cooperative, project based, inquiry based, guided discovery teaching strategies to a high extent. While chemistry teachers utilizes, problem solving, demonstration, fieldtrip, individual learning, multimedia, constructivist based, computer assisted instruction, peer tutoring, blended learning, power point, study aid, laboratory based, discussing, diagnostic teaching strategy and peer lead teaching strategy to a low extent. This result is in line with the findings of Osorung(2012) who revealed that many of the secondary school teachers employ cooperative learning, collaborative learning and inquiry-based learning, while computer assisted instruction, mastery learning, peer tutoring,

project-based teaching strategies are not usually utilized by Chemistry teachers.

The reason for this could be due to the fact teachers are more familiar with cooperative and inquiry-based teaching and also there may be need for Chemistry teachers' awareness toward the use of these constructivist based teaching strategies in teaching and learning. Hence there is need for Chemistry teachers to adopt some other kinds of teaching strategies in order to enhance students' academic achievement in Chemistry.

The findings of this study revealed that there is a significant difference on utilization of constructivist based teaching strategies with regards to teacher's qualification. *The findings of this study contradicts that of Onyelekan, Igbokwu and Olorundare(2017) who found no significant difference in science teachers' level of constructivist based teaching strategies based on qualification. The findings of this study agree with that of Khursid and Zahur(2013) who reported that teachers with professional qualification are more aware and utilize constructivist based teaching methods that teachers without professional qualification.*

The findings of the study revealed that Chemistry teachers' experience had no significant influence on utilization of constructivist based teaching strategies. The result of this study is in line with that of Tella(2018) who conducted a study on teachers' variable as predictors to academic achievement of primary school pupils which revealed that teachers' experience had no significant influence on pupils' achievement.

The reason for this result could be due to the fact that some teachers who have recently graduated and are gainfully employed could have been exposed to some of these constructivist based teaching strategies. Hence, a teacher who has spent substantial number of years in the teaching profession may have been exposed to various constructivist based teaching strategies through workshop, seminars and conferences.

Furthermore, this study showed no significant difference on Chemistry teachers' gender on utilization of constructivist based teaching strategies in senior secondary schools. The study is in line with that of Malik and Sharma(2013) who revealed that gender of teachers does not bear any relationship with teaching effectiveness. This implies that utilization of constructivist based teaching strategies is not dependent on teachers' gender. Also, Nwagbo and Ugwuanyi(2015) investigated the influence of gender on science teachers' pedagogical beliefs and ICT classroom practices in secondary schools and the study revealed that both male and female science teachers have similar level of innovative pedagogical belief and ability to utilize instructional strategies. . This may imply that if both male and female Chemistry teachers have the same academic training, there is every tendency of likelihood in utilization of constructivist based teaching strategies. Hence, the ability to utilize constructivist based teaching strategies is not dependent on teachers' gender.

Conclusion

Based on the findings of the study, there was a significant influence of teachers' qualifications on Chemistry teachers' utilization of constructivist based teaching strategies in senior secondary schools. This means that teachers' qualifications influence the utilization of constructivist based teaching strategies. There is no significant influence of Chemistry teachers' teaching experience on utilization of constructivist based teaching strategies in senior secondary schools. This implies that teachers' years of experiences do not influence utilization of constructivist based teaching strategies. Gender has no influence on Chemistry teachers' utilization of constructivist based teaching strategies.

Recommendations

The Science Teachers Association of Nigeria(STAN) should re-emphasize the use of constructivist teaching strategies in the STEM conference sub-themes. Other teachers' associations should in-cooperate these strategies in their conferences and workshops. Ministries of Education and School managements should sponsor teachers to workshops, conferences and seminars to refresh and learn current pedagogies in classroom practices.

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