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Perceived teachers' use of teaching strategies and achievement of chemistry students in Ondo State, Nigeria

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Abstract
This study explores perceived use of student-centered teaching strategies and achievement of chemistry students in Ondo State, Nigeria. The population study is all the SSS III chemistry post-basic students and chemistry teachers teaching the students in the public post-basic schools in Ondo State, Nigeria. Using simple random sampling, two local government areas were selected in each of the available three senatorial districts. The sample is made up of 1,307 chemistry students and 43 chemistry teachers. Teacher Teaching Strategies Awareness Inventory (TTSAI) was given to 3 senior chemistry teachers for validation. Teachers' Use of Teaching Strategies Questionnaire (TUTSQ) (r= 0.89) were used in the study. A Chemistry Achievement Test (CAT) was used to determine the student achievement (KR-20 = 0.80). The demonstration teaching has the highest awareness level among chemistry teachers. The demonstration and metacognitive teaching strategies had a positive contribution to chemistry students' achievement while the metacognitive teaching has the most prevalent use among the studied six teaching strategies. Recommendation is that while teachers should create more awareness for concept mapping in chemistry, the use of cooperative and concept mapping teaching strategies should be encouraged among the chemistry teachers by relevant authorities.

Key word: Teaching Strategies, Awareness-Level, Chemistry Teachers, Chemistry Students, Chemistry achievement

Background to the Study
Science education has been the bedrock of sustainable development in any society. Indeed, Chemistry science is very important in the study or understanding of any science related course. This means that chemistry is indispensable to any society. Fields in the medical line, agriculture and other major sectors in the world are among the many chemistry-related sectors. This points to the inevitability that for any nation to expand in science and technology, teachers' teaching and students' learning of chemistry is to be continuously enhanced.

Ondo State, Nigeria has been one of the leading states in Nigeria that has high performance in external examinations in the time past. However, a look at the performance of the students in chemistry at the post basic schools shows that there is a lot to be examined by future and present research in enhancing performance in chemistry in the state. In the course of examining the performance of the Senior Secondary School Chemistry results, Fatoba, Akinnodi, Adeleye & Olofin (2020) found out that Ondo State in 2009,2010, 2011, 2012, 2013, 2014, 2015, 2016 and 2017 had 34.12%, 32.01%, 30.82%, 31.04%,29.17%, 33.12%, 32.12%, 34.03% and 38.29% respectively of students passing at credit level and above. The joint promotional examination conducted by the Ondo State government as shown in Table 1.1 shows that many students are performing at average or little above average levels in chemistry, hence every effort should be made to enhance the students' performance in chemistry. There is the need to find ways of improving chemistry achievement in the state and in Nigeria at large.

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Table 1.1: Statistics of Entries and Results for the SS Two Joint Promotional Examination (2016–2020) on Chemistry in Ondo State, (score is between 0 – 100).

Year	Total Entry	0 – 39.9	40-59.9	60 – 79.9	80 – 100
2016	17255	256(1.48%)	16060(93.07%)	840(4.87%)	99(0.57%)
2017	20001	285(1.47%)	19411(97.05%)	152(0.76%)	153(0.76%)
2018	19199	262(1.36%)	18090(94.22%)	258(1.34%)	589(3.07%)
2019	21561	254(1.18%)	20426(94.73%)	663(3.07%)	218(1.01%)
2020	15115	891(5.89%)	13798(91.29%)	361(2.39%)	65(0.43%)

Source: Ministry of Education, Examinations and Record Department, Ondo State (2021)

Chemistry, to some degree, is a highly abstract subject and this makes students sometimes perceive Chemistry to be a difficult subject. One reason for this is that students link how abstract a subject is to its high level of complexity and intricacy. Chemistry as a subject with this nature could be said to be a generally difficult and inflexible subject. Though Chemistry in its nature is highly conceptual, much cannot be acquired by rote and surface learning in the subject. Good achievement in chemistry requires a good understanding of the subject and its concepts in meaningful ways. According to Nagel and Lindsey, (2015) and Burrows and Mooring, (2015), chemistry educators over the years, have seen that using the conventional or teacher-centred instruction mode has led to many students gaining little in their knowledge of chemistry. These students end up not learning chemistry concepts well and are unable to make links among such chemistry concepts as chemical bonding, mixture, enthalpy change, energy and energy change, heat and temperature, acids and bases and others.

In science education, it is believed that effective teaching mainly takes place when students are able to learn and accomplish scientific objectives and not just return of scientific knowledge exactly as the science teachers taught the students (Omoifo 2012). Many research findings indicate that effective teachers display proficiency in their subject matter when they utilize varying instructional strategies, express knowledge of assessment, and contribute to students' growth academically (Akram, 2018).

Over the years, lecture method has been used in teaching science subjects with teachers justifying that it allows them complete given contents of the curriculum at the appropriate time (Bligh, 2000). Many teachers also adopt this teaching method because of convenience. Raheem (2012) opined that the teacher-centered teaching method could not inspire students' innovative thinking and adoption of, scientific and inquiry method, while Okwilagwe (2003) also believed that the teacher-centered teaching method makes the students comprehension of concepts short-lived. However, Martel (2009) is of the opinion that teachers who choose from an array of instructional teaching methods are efficient and effective in their teaching since such teachers apply different teaching strategies appropriately to improve student performance.

In Nigeria, common students centered teaching strategies that are used in post basic schools abound. According to Vaikunth and Manjula (2016), teaching strategies that transfer active role to the students during teaching are students centered teaching strategies. However this study will be limited to six students centered teaching strategies commonly used in Nigeria. The six students teaching strategies are selected due to their easy adaptation and use in Nigeria schools. These are Problem-based inquiry, Cooperative teaching, Concept mapping, Metacognitive teaching, Discussion and Demonstration teaching strategies. These teaching strategies in this study are thought of to be used by chemistry teachers in all public post basic school in Ondo State Nigeria unlike the adapted student teaching strategy used in this twenty first century.

Concept mapping teaching strategy influenced students' learning as it helps students adapt new information to what they already know. This enables the students to self-expand their

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knowledge and is able to organize meaningful array of connection of ideas, concept or nomenclatures so that already known conceptions are re-arranged and enriched, thus consequently allowing conceptual changes to take place. Concept mapping have a significant positive effect on chemistry achievement of students, (Fatokun and Eniayeju 2014, Kilic and Aziz 2013). Cooperative teaching strategy is another student-centered teaching strategy that influences learning by means of creating environments where students start learning together, helping and peer tutoring each other as well as working towards a common goal (Lazarowitz and Hertz-Lazarowitz, 1998).The students learn to explain, listen and negotiate actions and meanings and thus become better prepared for a world outside the classroom, where such activities are required on a daily basis. Cooperative teaching strategy leads to the integration of all students and is thereby motivating especially for the disadvantaged minorities.

Demonstration teaching strategy is a student-centered teaching strategy that teachers use in the teaching of chemistry. Demonstration teaching strategy is mostly used to achieve psychomotor and cognitive objectives in chemistry teachings. The teacher will be the one to perform the teaching for the students, conducting the experiments in a chemistry class while students observe and are allowed to ask as many possible questions with reference to the experimental activities performed by the teacher. The students are then required to replicate what the students have learned in the course of the activities in class or in the chemistry laboratory.

Discussion teaching strategy is another viable student-centered teaching strategy in science which lays emphasis on learning through participation by everyone in the class, instead of teaching carried out only by the teacher. Classroom discussions are made to allow students to take intellectual risks. Probing questions, which are exploratory and reflective are mostly used by the teacher to direct and guide the teaching as well as probe details and fundamental knowledge. Questions that scrutinize assumptions, conclusions, and interpretations; relational questions that seek to juxtapose between ideas, thoughts, or issues and also investigative questions that probe motives or causes are explicitly engaged when classroom discussion strategy is employed. This strategy has been found to contribute extensively to achievements in secondary school chemistry (Omwirhiren 2014).

Problem-based inquiry student centered teaching strategy focuses on learning by doing with minimal instruction. Students learn by discovering, interrogating and exploring with problems and questions posed by the teacher. The teacher's role changes to that of a facilitator in guiding the students in problem-solving and inquiries without playing down on what the students can do which is vital in active and dynamic learning tactics. Teaching and learning are therefore incorporated which consequently make teachers and students become partners in the learning development of the students (Peter and Karen 2005).

Teaching Strategies in Chemistry

Teaching in recent times in the conventional setting has moved away from just transmission of knowledge to how effectively that knowledge is transferred. Wherever teaching takes place, learning is expected to consequently take place, and as such both are interwoven. Teaching methods are the methods teachers employ in convening teaching objectives of a lesson plan, including instructional techniques, content of the subject and the procedures for the use of teaching materials for instruction dissemination. In the teaching process, the main purpose of a teacher is to deliver lessons that are not only desirable but those that will produce evidence that learners have actually achieved the lesson objectives. Ezekannagha (2008), Shymansky and Kyle (2008) asserted that teaching strategy are the teaching materials, media, background and the teacher's behaviour adequately engaged to stimulate an environment in order to create a lasting effect on the learner.

The teaching of chemistry at the post basic school must be a result-oriented teaching. This is because students that undergo instructions in chemistry must be able to demonstrate good

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science skills, process skills and logical understanding of chemistry nomenclatures. What has become imperative in recent years about improving chemistry students' outcomes is the need to improve the quality of the teaching effectiveness of teachers. Teachers need to build up and sustain students' interest in chemistry as a subject through their method of teaching. Classroom observations by Owolabi (2012) in Nigerian post basic schools show that science classroom activities are teacher-centered. Ogundare (2019) found out that teacher dominating style of teaching (teacher talk alone) was 73.8% and the integrating style of teaching (students talk alone) was 9.4% in a 10- minute threshold time when chemistry teachers were observed during teaching using an adopted class interaction observation sheet. Yewande (2015), while trying to find out the sources of misconception in chemistry at the post-basic level in Nigeria, also discovered that teachers are the only ones who mostly talk in chemistry classes.

The science teachers' continued reliance on the use of teacher-centered methods is linked to the teachers not having the technical know-how and ability in what they are teaching in science subject. This suggests that achieving instructional goals and knowing the teaching strategies to use are alike. Erdem (2012) gave about four characteristics of effective teaching strategies to be that:

- teaching strategies should enable a student create chances to learn by mounting the student's desire for studying and understanding new situation.
- teaching strategies should be tailored to efficiently aid learners to speedily get the information disseminated via the instruction, and build up the learner's abilities in understanding and adapting knowledge.
- teaching strategies should be arranged in the order of importance and most helpful approach so that students can grasp new knowledge by adapting their existing knowledge.

Ajaja (2007) gave the following objectives in guiding the teaching science in post-basic schools to be:

- Having the knowledge relating to academic discipline in science,
- Been able to have the option of skills relating to scientific process and method,
- Obtaining distinct and good explanations for cultural relating issues which aid having interest in science literacy and societal goals, and taking the needs of individual and career consciousness into consideration.

As good as teachers may be, their strategies of conveying instruction in teaching process are very essential and remain an end result to effective teaching of the students. Good pedagogy involves the capacity to put across knowledge in ways that students acclimatize and effortlessly understand, remember and apply. A desirable pedagogical skill is that of passing instructions on subject content effectively. This skill mostly depends on the subject matter and level of instruction, as those skills needed to teach primary school pupils electricity in basic science are remarkably different from those required to teach post basic school students acids, base and salt in chemistry. A teaching strategy in conclusion is simply a technique or method that a teacher planned for classroom interactions. Teaching strategy also implies that the teacher outlines and follows the methods painstakingly to effectively pass knowledge about a concept, topic or an idea to the students.

Studies that have explored the frequent use of some student centered teaching strategies in chemistry did so only by making use of teachers' rating and teachers' report of their teaching strategies which may possibly be subjective, (Oyelekan, Igbokwe and Olorundare 2017). Some studies that made use of students' rating of prevalent use of these students centred teaching strategies at the post basic schools did not give consideration to students' understanding of what a teaching strategy can be (Agommuoh and Ifeanacho, 2013). Students are the beneficiaries of any instructional strategy adopted by the teacher in the classroom, therefore using students' rating of teaching strategies adopted by teachers is one of the main tools to appraise and improve teaching (Miller and Seldin, 2014).The

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teachers can be rated by the same students who are listening to them because students' ratings and observation can tell more of what goes on during the teaching-learning process.

Chemistry teachers are also expected to be aware of student-centered teaching strategies that can be effectively used in disseminating instruction. Teaching strategies that teachers are not aware of cannot be used by the teachers. It is also crucial that the awareness of these teaching strategies be investigated among the teachers. It is important for chemistry teachers to have good knowledge of using apposite teaching method in teaching as the curriculum is diversified and different platforms are provided for learners to learn.

Chemistry students' achievement has experienced gradual improvement from WAEC reports over the years in Nigeria, and there is need to sustain the increase and improve on it. However, in Ondo state, Nigeria, the achievement of Chemistry students' needs great improvement if students are to achieve outstandingly. Studies on prevalent use of some student-centered teaching strategies among chemistry teachers giving post basic education in Nigeria have not been given the deserved attention even when there have been abundant empirical studies to show the effect of these teaching strategies on chemistry achievement. Empirical studies outside Nigeria have also established the predominant use of some student-centered teaching strategies in colleges, but exploring the predominant use of student-centered teaching strategies in chemistry from the standpoint of post basic chemistry students' who are the beneficiaries of the teaching strategies, using large sample size, requires research attention in Nigeria. This study investigated the awareness of six student-centered teaching strategies by chemistry teachers, the predominant use of the perceived teaching strategies by these chemistry teachers, and the level in which the teaching strategies can determine students' achievement in pos-basic school chemistry.

Research Questions

1. To what extent are chemistry teachers aware of student-centered teaching strategies (Problem-based inquiry, Cooperative teaching, Concept mapping, Metacognitive teaching, Discussion and Demonstration)?
2. To what extent would the perceived teachers' use of the teaching strategies (Problem-based inquiry, Cooperative teaching, Concept mapping, Metacognitive teaching, Discussion and Demonstration) jointly and independently predict students' achievement in chemistry?
3. What student centered teaching strategy is predominantly used among chemistry teachers in Ondo state senior post basic schools?

Methodology

Survey type research guide this study. The population for the study was all the SSS III chemistry students and their chemistry teachers in the public post basic schools in Ondo State, Nigeria. The eighteen local government areas of Ondo State were taken as already stratified groups along the available three senatorial districts. Next was using simple random sampling to select two local government areas from each of the available three senatorial districts (to have six local government areas). Also, simple random sampling was used to select nine public post basic schools from each local government area (to have fifty-four public post basic schools). Intact classes of post basic school three chemistry students were purposively selected in each of the nine schools in a local government area for the study (the study is interested in chemistry students only). One chemistry teachers who teach the SS three chemistry students was purposively selected in each of the selected schools. The sample size was calculated by the finite formula proposed by Cochran (1977) for known population. The total population of the public post basic SSS 3 chemistry students in Ondo state was 26,290 (Ondo State Ministry of Education, Science and Technology, 2022). 3% margin error was used to arrive at 1,067 sample size needed for the study. However, a total of 1,307chemistry students and 54 chemistry teachers were used for this study. Forty--three out of the 54 chemistry teachers that teach the students from the sample population

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were available for selection to verify the awareness of the teaching strategies among the chemistry teachers.,

Two Instruments and a Chemistry Achievement Test were used in the study. Teacher Teaching Strategies Awareness Inventory (TTSAI) was used to collect data about the extent of awareness of six teaching strategies among the chemistry teachers in Ondo state post basic schools. The Teachers' Use of Teaching Strategies Questionnaire (TUTSQ) was used to obtained information from the students regarding the use of teaching strategies in the teaching of chemistry by their teachers. This questionnaire was developed by the researchers based on expected activities of teachers when using a teaching strategy. It contains 42 items on available teaching steps or procedures in six student-centered teaching strategies used in chemistry with response options ranging from Almost All the Time = 4, Very Often = 3, Occasionally = 2, Rarely = 1. In order to establish that each item is connected to a named teaching strategy, the questionnaire was given to experts in Teacher Education for comment and necessary contributions. The instrument was administered to post basic school three chemistry students in another population different from the sampled population to determine the reliability of the instrument using Cronbach alpha and found to be 0.89.

The Chemistry Achievement Test (CAT) consists of 30 Chemistry items pooled out of initial 90-items through item analysis. The test items were drawn from the SS1 and SS2 syllabuses only to ensure all responding students would have been taught the items question. The reliability was determined using Kuder-Richardson formula 20 and was found to be 0.80. Some assumptions of multiple regressions were done on the data collected for this study to ascertain that the multiple regression test can be used for analysis in this study.

Results and Discussion

Table1: Chemistry Teachers Teaching Strategy Awareness Level

Teaching Strategy	Not at all	Little extent	Some extent	Great extent	Mean	Std. Dev
Problem-based inquiry	2(4.7%)	3(7.0%)	15(34.9%)	23(53.3%)	3.37	0.81
Cooperative	2(4.7%)	4(9.3%)	14(32.6%)	23(53.3%)	3.35	0.84
Concept mapping	5(11.6%)	9(20.9%)	23(53.3%)	6(14.0%)	2.70	0.86
Metacognitive	4(9.3%)	8(18.6%)	14(32.6%)	17(39.5%)	3.02	0.99
Discussion	1(2.3%)	0(0.0%)	10(23.3%)	32(74.4%)	3.70	0.60
Demonstration	1(2.3%)	7(16.3%)	0(0.0%)	35(81.4%)	3.77	0.57
Total	15(5.81%)	31(12.01%)	76(29.45%)	136(52.71%)		
Average Weighted Mean					3.02	

The Demonstration Teaching Strategy has the most prevalent awareness level among the chemistry teachers, closely followed by the Discussion Teaching Strategy while the Concept Mapping Teaching Strategy has the lowest awareness level among the six studied teaching strategies.

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Table 2: Regression Analysis of the combined prediction of chemistry students' achievement by the six independent variables

R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.166	0.028	0.023	3.806		
ANOVA Model	Sum of Squares	Df	Mean Square	F	Sig..
]Regression	536.851	6	89.475	6.176	0 .000
_Residual	18832.667	1300	14.487		
Total	19369.518	1306			

Table 2: shows composite contribution of the six predictor variables (Problem-based inquiry, Cooperative teaching, Concept mapping, Metacognitive teaching, Discussion and Demonstration) to the prediction of the Students' Chemistry Achievement. The Table shows a coefficient of multiple correlation (R =0.166), adjusted R^2 value of 0.028. Therefore about 2.8% of the variance is accounted for by the six predictor variables when taken together. The 98.2% remaining could be the contribution of other variables not considered in this study. The significance of the composite contribution was tested at $p<0.05$ using the F- ratio at the degree of freedom (df = 6/1300). The table also shows that the analysis of variance for the regression yielded a F-ratio of 6.176 (significant at 0.05 level).

Table 3: Relative Contribution of six predictor variables to Students' Chemistry Achievement

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std.Error	Beta	T	Sig.
(Constant)	12.557	.735		17.079	.000
Problem-inquiry based	-.017	.038	-.016	-.444	.657
Cooperative	-.040	.032	-.047	-1.285	.199
Concept mapping	-.020	.037	-.020	-.541	.589
Metacognitive	.000	.040	.000	.010	.992
Discussion	-.111	.036	-.116	-3.061	.002
Demonstration	.002	.032	.002	.065	.948

Dependent Variable: Chemistry Achievement

Table 3 shows the relative contribution of the six predictor variables to the criterion variable, expressed as beta weights. Among the teaching strategies, Demonstration (B = 0.002, t= 0.065, p. 0.05) is the most potent contributor to the prediction followed by the Metacognitive (B = 0.00, t= -3.061, $p<0.05$) followed by Discussion (B= -0.111, t=-3.061, p< 0.05); followed by Cooperative (B= -0.040, t=-0.1.285, p > 0.05); followed by Concept mapping (B= -0.020, t= -0.541, p < 0.05); and finally by Problem-inquiry based (B = -0.017, t= -0.444, p>0.05).

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Table 4: Weighted Average Mean of the level of use of the Six Teaching Strategies

S/N	Teaching strategy	Weighted Average Mean
1	Problem-inquiry	3.01
2	Cooperative	2.90
3	Concept mapping	2.99
4	Metacognitive	3.10
5	Discussion	3.07
6	Demonstration	3.02

The Metacognitive Teaching Strategy is perceived by the chemistry students to have the most prevalent use by the chemistry teachers, closely followed by the Discussion Teaching Strategy while the Cooperative Teaching Strategy has the lowest prevalent use among the six studied teaching strategies in Ondo state.

Discussion

Table 1 revealed that the Chemistry teachers are aware of the six teaching strategies examined in this study. In general, the average weighted mean is 3.02, indicating awareness to some extent. This suggests that the teachers who are aware of the six teaching strategies are about 75% based on the rating response options.

The Demonstration Teaching Strategy was found to be the teaching strategy that has the highest awareness level as it has the average mean score (mean = 3.77 sd=0.57). This is due to the fact that most concepts in chemistry require demonstration for better understanding of concepts. The Concept Mapping teaching Strategy has the lowest level of awareness as it has the lowest mean score (mean= 2.70 sd=0.86). This can be due to the fact that it is difficult to associate concepts in chemistry and also draw links between disparate concepts. Samba, Achor and Ogbeba (2010) support this finding as they confirmed that teachers are aware of student-centred teaching strategies as about 63.3% of the teachers investigated shows awareness of the teaching strategies studied even when the use of the teaching strategies was not found. Oyelekan, Igbokwe and Olorundare (2017) also agree with the assertion of this result in this present study. This also agrees with Pradeep (2019), who found that the teachers in India are 100% aware of cooperative learning, problem-based learning and project teaching strategies among a list of 21 investigated teaching strategies.

In table 2, the perceived use of the six teaching strategies by the chemistry students are able to jointly contribute about 2.8% to the chemistry achievement of the students. The table also shows that the analysis of variance for the regression yielded a F-ratio of 6.176 (significant at 0.05 level). These mean that the joint contribution of the six perceived teaching strategies by the chemistry students to the chemistry achievement of the students was significant.

The result in table 3 shows that Metacognitive and Demonstration teaching has positive contribution to the student chemistry achievement. The discussion teaching strategy in Table 3 is the only teaching strategy that has a significant contribution to students' achievement out of the perceived use of the studied six teaching strategies. This means that the students perceived the use of discussion teaching among the teachers and this use is able to influence the students' chemistry achievement. The result in this study has shown that the chemistry teachers are well aware of the discussion teaching strategy and chemistry students have perceived the high prevalent use of the discussion teaching strategy among the chemistry students, the discussion teaching do not make the students to achieve well in chemistry in this study ($p<0.05$). This suggests that as the perceived use of the discussion teaching increases among the chemistry teachers, the student chemistry achievement decreases (beta weight = -0.111). This result could have been that discussion teaching is not effective when used in science class with class sizes that are large, and when students are less active in the class, or having a class of many less active students and few dominating students.

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Another reason is that when discussion teaching is not organized or haphazardly done, a positive result will not be obtained. Also, Niia, Almqvist, Brunnberg and Granlund, (2015), conclude that teachers and students attribute disparate connotations to students' participation during discussion teaching and learning. The students viewed class participation as a means to socialize while teachers viewed class participation during discussion as an action closely connected with academic achievement.

In table 4, the result reveals that teachers used the six teaching strategies studied very often and none of the teaching strategies was used almost all the time. The metacognitive teaching strategy has the highest prevalent use (mean = 3.10) followed by the discussion teaching strategy (mean =3.07), demonstration teaching strategy (mean =3.02), problem-inquiry teaching strategy (mean = 3.01) and concept mapping (mean =2.99) respectively. Cooperative teaching strategy has the lowest prevalent use among the six teaching strategies (mean=2.90). Mohammed (2015) supported this result that the science teachers have a high level of perception about metacognition and thus the teachers will engage students in metacognition teaching. Also Cook, Kennedy and McGuire (2013) found out that when chemistry students are engaged in metacognitive learning strategies, the students perform well in the subject. This result may be due the fact that metacognition teaching techniques abound for science teachers to use. This study agrees with Schwartz, Scott, and Holzberger, (2013) who found that teachers use teaching, prompting, and facilitation of learners' use of metacognitive strategies in class and that this effort results in enhanced learning performance of the students. Also, Thomas and Anderson (2014) observed that teachers use practices that promote metacognition in students and this results in students improving on their metacognition knowledge.

Cooperative teaching has been known to foster social skills through interaction, encourage interactivity among students, but this study has shown that cooperative teaching has the lowest prevalent use and insignificant contribution to chemistry achievement. This finding agrees with Buchs, Filippou, Pulfrey, and Volpe, (2017) who state that teachers can find the use of cooperative teaching tasking due to the fact that some students depend on others for help, time to engage in cooperation learning is inadequately provided for in the curriculum, loss of productivity if group members unequally contribute, and students' not having the skills to cooperate with peers.

In general, the six student-centered teaching strategies have been used very often by the teachers. Chemistry teachers were perceived by their chemistry students to use these six teaching strategies very often as teaching strategies is believed to overlap in usage. This finding is however contrary to the work of Eilks, Prins and Lazarowitz, (2013), who report that teachers have relied so much on the teacher-centered approach in classes.

Conclusion

The study of the six teaching strategies has shown that the Chemistry teachers are aware of the six studied teaching strategies to some extent. The metacognitive teaching strategy is the most predominantly used teaching strategy among chemistry teachers in Ondo state, Nigeria.

Recommendation

It is recommended that Chemistry teachers need to improve on the use of the studied teaching strategies. The demonstration teaching strategy shows a good contribution to students' chemistry achievement as such chemistry teachers should be encouraged to adopt more of demonstration teaching strategy in conveying instruction in Chemistry. The metacognitive teaching strategy has the most prevalent use and as such, teachers should continue the use as this teaching strategy is believed to make factual understanding of concepts in Chemistry easy for the students. This helps the students to relate and adapt their learning to real life situations. Teachers should also be encouraged to be more familiar with the concept mapping in Chemistry and relevant authority should make the concept mapping well known among the Chemistry teachers as Chemistry teachers show diminutive awareness of the teaching strategy.

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