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TOWARDS ADVANCES OF CHEMICAL EDUCATION AND INNOVATIVE TEACHING: EFFECT OF THINK-PAIR-SHARE COOPERATIVE LEARNING STRATEGY (TPSCLS) ON STUDENTS' INTEREST IN SECONDARY SCHOOL ORGANIC CHEMISTRY

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ABSTRACT

The study investigated the effects of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) on students' interest in secondary school organic chemistry. Three research questions and three hypotheses were formulated and tested at 0.05 significant level. Quasi-experimental design was adopted for the study, specifically, the non-equivalent pre-test, post-test, control group design. The study was carried out in Abakaliki Education zone of Ebonyi State. A sample size of eighty-seven (87) SS2 chemistry students (43 boys and 44 girls) from two intact classes drawn using multi-stage sampling technique was used. The experimental group were thought taught with TPSCL and the control group were thought using lecture strategy. The treatment lasted for six weeks. Organic Chemistry Interest Inventory (OCII) with Cronbach's alpha reliability of 0.86 was the instruments used and was validated by three (3) experts and used for pre-test and post-test. Mean and standard deviation were used to answer research questions while the Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The results revealed that there was a significant difference in the mean interest scores [(1643.635) p<.000] of students taught organic chemistry using TPSCLS and those taught organic chemistry using lecture strategy, there was no significant interaction between gender and teaching strategies for TPSCLS on students' mean interest scores [(.077) p>.782] in organic chemistry and there was no significant difference in the mean interest scores [(.000) p>.989] of male and female students taught organic chemistry using TPSCLS as revealed in the study. It was recommendations among others that science teachers, science educators and authors and textbook writers should adopt TPSCLS when teaching or writing of textbooks to enhance students' interest in organic chemistry.

Keywords: *Think-Pair-Share Cooperative Learning Strategy (TPSCLS), Interest, Organic Chemistry.*

Introduction

Chemistry, is one of the frontline science subjects thought in both secondary and tertiary school levels. Many science-based professions like biochemistry, medicine, engineering, nursing, agriculture, etc must do chemistry in the course of their study; its various branches include organic, inorganic, analytical, biochemistry, biophysical, physical chemistry to mention but a few. At secondary schools, it is both fundamental and foundational to higher engagement in chemistry related professions (Eze, Egbo & Okechineke, 2024); as such its importance to the nation cannot be downplayed. This is evident in the high enrolment of students in its senior school certificate examination (SSCE) yearly in both the internal and external (West African Examination Council, 2024).

According to the National policy on Education (NPE), the major objectives of chemistry as contained in the curriculum are to prepare students to acquire adequate skills for laboratory and field operations, acquire useful, meaningful and relevant cognition of chemistry, develop the ability to apply the acquired knowledge to their daily lives, which is a reflection of the desired scientific attitudes, inculcated in them at this level of learning, as the basic rudiments of chemistry which they will apply in their higher level of career and profession (National Policy on Education, FRN, 2014). In the bid to achieve these chemistry objectives as stipulated in the secondary school curriculum, emphasis is placed on the teaching processes and learning strategies adopted in other to allow the students to acquire the desired knowledge, skills and attitudes as well as develop their highest potentials (Pratoomtong, 2011, Eze, et. al., 2024 & Okechineke, 2025); as chemistry education plays important roles in enhancing the quality of output from teaching and research, ensuring that chemistry students are efficaciously equipped with proper knowledge to produce intensive goods and services necessary to meet human needs for food, shelter, healthcare products and other materials aimed at improving the quality of livelihood.

Teachers' adoption and utilization of suitable teaching processes and innovative learning strategies play a very important role in classroom transaction (transfer of learning). Innovative learning strategies not only have the potential to improve learners' achievement but can facilitate proper understanding of concepts learnt (Lom, 2012), and can also have positive effect on learners' motivation, interest, engagement and attitude (Okechineke, Eze, Iyida & Eze, 2024). One of such innovative teaching strategies that hold promises of improving these factors (achievement, interest, motivation and attitude) in learning is cooperative learning strategies.

Cooperative learning strategy is one of the innovative strategies which promotes the act of students working together in small groups as a team to achieve individualized optimum learning by themselves and the by team (Damit, Shahrill & Roslan 2015, Duraman, Shahrill & Morsidi 2015; Azmin, 2016; Bezir

2019). If implemented well, cooperative learning strategy, as revealed in Okechineke (2025), increases students' motivation; students' active learning, reasoning and thinking skills; students' achievement and interest; it also lessens the anxiety and disruptive behaviour of students by subjecting them to team up, assemble their ideas together and agree on a common ground before sharing their discoveries or learnt content as a 'team' or 'cooperative groups' with the entire classroom, as they either sink or swim together, because the students are responsible for both their own learning and also for the learning of others (Clarke, 2013; Damit, et. al, 2015; Bogam & Khan 2016; Bhandari, Mehta, Mavai, Singh & Singhal 2017; Okechineke, 2025). Okechineke (2025), revealed several cooperative learning strategies available for learning such as Jigsaw (JGS), Think-Pair-Share (TPS), Thinking-Aloud Pair Problem Solving (TAPPS), Three-Step Interview (TSI), Student Teams Achievement Division (STAD), Teams Games Tournaments (TGT) and Group Investigation (GI).

Think Pair Share is a cooperative strategy designed to provide learners with "food for thought" on a given topic and concept; enabling them to bring out their individual ideas and share the ideas with one another (Ariyani, 2013), irrespective of the class size and subject. It is used by teachers in mediating classroom interactions (Didimus & Duran, 2014), which enables students to engage in higher-level thinking; and encourages students to work together to solve problems or answer questions on an assigned topic (Andrew & Alexandria, 2015). The learners think about a question, generate and revise their hypothesis as well as elicit their inductive and deductive reasoning (Hmelo-Silver, 2013). TPSCLS is a multi-mode discussion cycle that incorporates three stages or components namely: time for thinking, time for sharing with a partner and time for each pair to share back to a larger group/entire class. Instructors pose a question, students first THINK to themselves, secondly discuss their thoughts with another person (PAIR), and finally, the 'pair' SHARE out what they discussed to the entire class (Tomaswick, 2017). TPSCLS helps students to develop positive interdependence as the students are able to learn from each other; provides individual accountability and face to face interaction amongst learners, because students are accountable to each other for sharing ideas; promotes classroom participation, with or without the presence of the teacher, by encouraging a high degree of student response; as well as unites the cognitive and social aspects of learning by promoting the development of thinking and the construction of knowledge (Cathy, 2013; Simon, 2013; Agbede & Ba'aba, 2019; Okechineke, 2025).

When adopted in learning chemistry, TPSCLS showed that, by the intrinsic nature of the learning strategy, students can learn any concept in chemistry from their peers. It affords slow pace learners and shy students the opportunity to build self-confidence in chemistry by learning from their peers (Marvin, 2015), improves students' desire to learn seeing that the task of learning is a collaborative effort where students can improve understanding of learning concept by sharing ideas. The thinking part of TPS facilitates students' active cognitive

engagement in learning and reduces absent mindedness during instruction, afford students the opportunity to take active role in their own learning through cognitive engagement, peer learning and sharing (Okechineke, 2025). Students synthesize and evaluate their ideas, or purported solutions to problems, apply them in understanding the solution better or in teaching their pair and further sharing their ideas with the whole class. The general idea of think-pair-share strategy is having the students independently think or solve a problem quietly, then pair up and share their thoughts or solution with someone else and this study examined if the same is applicable to chemistry especially in enhancing the interest of the students in studying secondary school organic chemistry.

Interest, often thought of as the psychological state of engaging with particular classes of objects, events, or ideas over time (Hidi & Renninger, 2014); and a process that contributes to learning (Hidi, 2018), interest is a powerful motivational factor that energizes learning, guides academic and career trajectories, and is essential to academic success. It is both a psychological state of attention and affection towards a particular object or topic, and an enduring predisposition to re-engage over time. When students are interested in any academic topic, they are more likely to go to class, pay attention, become engaged, take more courses, as well as process information effectively and ultimately perform well. (Eze, Egbo & Okechineke, 2024). Interest which can either be situational/conditional interest (extrinsic / externally induced) or individual/personal interest (intrinsic / internally induced) can be built when the students are engaged effectively in teaching and learning; and while situational interest catches students' attention, personal interest sustains and reinforces it. (Durik & Harackiewicz in Okechineke, 2025). A student's lack of interest in learning often stems from having no interest in the concepts or material presented to them (Eze, 2024). Sometimes, the way the learning content is presented also turns students off and it is the duty of the teacher to engage the students with the best strategy that will not only arouse, but sustain their interest throughout the lesson period.

The development of interest often leads to more robust participation, focused attention and enhancement of cognitive abilities of the students (Wigfield & Cambria, 2010); and there is growing evidence that students' interests is critical in the teaching-learning process, and are enhanced when they actively participate in activities (Wiseman & Hunt, 2013), engage in reflective thinking (Madu & Metu, 2012), and derives curiosity, engagement, commitment and the determination to succeed by driving their zeal to learn (Okechineke, 2025). In teaching and learning, students' academic interest should not be neglected since the failure of students to achieve or do well in the test, could be attributed to lack of interest (Ezea, 2014). This is because students' academic interest has a strong positive relationship with performance (Azmin, 2015); which also refers to the feeling of curiosity or concern among students about learning any task that draws all their attention (Ugwuanyi, Nwankwo & Ugwuoke, 2016).

Research conducted by Nwigwe & Izuagba (2011) asserted that learning strategies can stimulate or destroy interest, some other studies have also indicated that most teachers in Nigerian secondary schools mainly use lecture method in lesson delivery and finding have shown that it could be ineffective in the teaching of science subjects such as chemistry because it involves mostly talk-chalk approach and appeals to only the sense of hearing (Agwamba, 2014; Ogbu, 2018; Eke, 2021). There is need therefore, for chemistry teachers to adopt innovative teaching strategies in the teaching and learning of secondary school chemistry that could enhance and sustain their interest irrespective of students' gender.

Another issue of contention in our society including the educational system in Nigeria today is the issue of gender (Eze, Egbo & Okechineke, 2024). Gender is the state of being male or female (Suzanne, 2010); Mbonu and Okoli (2019) described gender as a socially ascribed attribute which differentiates male from female, is another factor commonly associated with students' interest in the sciences education which has attracted the attention of many researchers (Amedu, 2015; Hydea & Mertzb, 2016; Alamri, 2018), and gender difference issue has been something of serious concern traced to the origin of man-kind (Kurumeh, 2014; Ezeliora, 2014).

Gender related issues in science education have continued to receive serious attention, judging from the number of studies done to that effect. Some researchers found that male students perform better than females in chemistry (Eric, 2015), and other science subjects (Nwachukwu, 2014; Amedu, 2015; Forgasz,, et al, 2017), while some (Alamri, 2018; Hydea & Mertzb, 2016) revealed that female students perform better than their male counterparts; whereas others showed that there is no significant difference between male and female students in science subjects (Kingdom, Ibemenji, Etokeren, & Chijioke, 2019) and chemistry in particular (Okechineke, 2025).

Some researchers consider science learning as a typical gender role–stereotyped domain in which boys and girls tend to be strongly conditioned by the self-perception of their competencies and skills. This, most at times, results in resistance and lack of self-confidence (typical in girls) or in overestimation and excess of desire to be in the limelight (typical in boys) (Cuomo, et al., 2017). Different strategies of instruction are either gender sensitive or gender bias. Effective teaching strategies however, should enhance and sustain academic interest for male students much as it does for female students. Based on the inconsistency on the results of male and female students' interest in science at large, it is pertinent to investigate whether the use of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) would enhance interest of students in chemistry irrespective of their gender.

Applying Think-Pair-Share Cooperative Learning Strategy (TPSCLS) is significantly important because it can help to train the students' academic skill, individual accountability, positive interdependence, the improvement of students' interaction, communication skill, discussion, working together, and also it can significantly enhance

and sustain the students' interest in the learning process in different subjects. This is because interest derives curiosity, engagement, commitment and the determination to succeed. It is the students' interests that drive their zeal to learn. This linkage underpins the paradigm of cooperative learning strategy where the students are the main drivers of the process in their active engagement and participation. This cooperative strategy recognizes individual differences in learners and encourages them to create their own knowledge at their own pace in any subject matter, irrespective of gender. Therefore, if Think-Pair-Share cooperative learning strategy is used in learning chemistry in secondary schools, what will be the effect on the interest of the students in chemistry when compared with the lecture method? It is in view of this that this study became necessary.

Purpose of the study

The main purpose of this study is to investigate the effect of think-pair-share cooperative learning strategies on students' interest in secondary school organic chemistry. Specifically, this study determined:

1. the mean interest score of SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS) and their counterparts taught with lecture method (LM);
2. the mean interest scores of male and female SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS); and
3. the interaction effect of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) with Lecture Method (LM) and gender on students' mean interest score in organic chemistry

Research Questions

The following research questions were posed to guide this study:

1. What is the mean interest score of SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS) as compared with that of their counterparts taught with lecture method (LM)?
2. What are the mean interest scores of male and female SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS)?
3. What is the interaction effect of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) with Lecture Method (LM) and gender on students' mean interest score in organic chemistry?

Hypotheses

The following hypotheses were formulated and tested at alpha level of 0.05.

Ho_1: There is no significant difference between the mean interest score of SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS) and their counterparts taught with lecture method (LM);

Ho_2: There is no significant difference between the mean interest

scores of male and female SS2 students taught chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS);

Ho_3: There is no significant interaction effect of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) with Lecture Method (LM) and gender on students' mean interest score in organic chemistry.

Method

Quasi-experimental design, specifically the non-equivalent control group design was employed in this study. This study was carried out in Abakaliki Education zone of Ebonyi State, Nigeria. A sample size of eighty-seven (87) SS2 chemistry students (43 boys and 44 girls) from two intact classes drawn using multi-stage sampling technique was used for the study. One group was used for experimental (taught with TPSCLS = 40) and second group was used as control group (taught with LM = 47). Organic chemistry interest inventory (OCII) was the instrument used in this study, which was structured in four-point rating scale with the following four response options to which numerical value were assigned thus: strongly agree (SA) = 4, Agree (A) = 3 Disagree (D) = 2 and Strongly Disagree (SD) = 1; with an internal consistency reliability coefficient of 0.86 arrived at using Cronbach's alpha formula. Research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05% level of significance.

Results

The results were presented in accordance with the research questions and hypotheses that guided the study.

Research Question 1. What is the mean interest score of SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS) as compared with that of their counterparts taught with lecture method (LM)?

Responses on mean interest scores of SS2 students taught organic chemistry using TPSCLS and those with lecture method

For research question 1., data obtained with the OCII for the treatment (TPSCLS) and control (LM) groups were used to answer the research question. Summary of result of data analysis is presented in table 1.

Table 1: *summary of pre-test, post-test and standard deviation of mean interest scores of SS2 students taught organic chemistry using* TPSCLS *and those with lecture method (LM)*

Method	N	Pre-test		Post-test		Gain Score
		Mean	SD	Mean	SD	
Experimental (TPSCLS)	40	1.95	0.10	3.60	0.11	1.65
Control (LM)	47	1.84	0.11	2.52	0.10	0.68
Total/Gain Score Difference	87	1.89	0.12	3.01	0.55	0.97

Table 1 shows that SS2 students taught organic chemistry using TPSCLS had a higher mean interest score (3.60), with SD of 0.11, than those taught using lecture method (2.52), having SD of 0.10. These results show that the experimental group taught organic chemistry with TPSCLS had a higher mean interest gain score of 1.65 (i.e. 3.60 – 1.95 = 1.65) than their counterparts in the control group taught with the lecture method which is 0.68 (i.e. 2.52 – 1.84 = 0.68), with a mean interest gain score difference of 0.97 (i.e. 1.65 – 0.68 = 0.97). This implies that TPSCLS enhanced the students' interest in organic chemistry than the conventional lecture method.

Research Question 2: What are the mean interest scores of male and female SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS)?

Response on mean interest scores of male and female SS2 students taught organic chemistry using TPSCLS

For research question 2, data obtained with the OCII for the treatment (TPSCLS) alone was used to answer the research question. Summary of result of data analysis is presented in table 2.

Table 2: *summary of pre-test, post-test and standard deviation of mean interest scores of male and female students taught chemistry using* TPSCLS

Gender	N	Pre-test		Post-test		Gain Score
		Mean	SD	Mean	SD	
Male	23	1.97	0.11	3.60	0.13	1.63
Female	17	1.93	0.08	3.59	0.10	1.66
Total/Gain Score Difference	40	1.95	0.10	3.60	0.11	-0.03

Result on Table 2 showed that male students taught organic chemistry using TPSCLS had a slightly higher mean interest score (3.60), having SD of 0.13, than their female counterparts (3.59), having SD of 0.10. This implies that TPSCLS enhanced the male students' interest score in organic chemistry than that of their female counterparts. Nevertheless, this result also shows that the female students taught organic chemistry with TPSCLS had a higher mean interest gain score of 1.66 (i.e. 3.59 – 1.93 = 1.66) than their male counterparts in the same experimental group taught organic chemistry with TPSCLS which is 1.63 (i.e. 3.60 – 1.97 = 1.63), with a mean achievement gain score difference of -0.03 (i.e. 1.63 – 1.66 = -0.03). This implies that TPSCLS enhanced the female students' interest in organic chemistry than the male. Nevertheless, the inferential statistics of ANCOVA will reveal if the difference in mean score is significant between the two genders.

Research Question 3: What is the interaction effect of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) with Lecture Method (LM) and gender on students' mean interest score in organic chemistry?

Response on interaction between gender and teaching strategies on students mean interest scores in organic chemistry

Adjusted mean for the two levels of gender that were subjected to use of TPSCLS and those subjected to the lecture method were used to access the interaction. Summary of result is presented in table 3

Table 3: *summary of interaction between gender and teaching strategies (TPSCLS & LM) on students mean interest score in chemistry*

Dependent Variable: Post-interest score (Estimates)

Group_ TPSCLS	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experimental	Male	3.589[a]	.024	3.541	3.636
	Female	3.582[a]	.026	3.530	3.634
Control	Male	2.521[a]	.023	2.474	2.567
	Female	2.527[a]	.023	2.481	2.573

a. Covariates appearing in the model are evaluated at the following values: Pre-test = 1.89 & post-test = 3.01

Summary of result presented in Table 3 revealed clearly that the mean interest scores of the experimental group taught organic chemistry with TPSCLS (3.589[a] for male and 3.582[a] for female) is higher than that of the control group taught organic chemistry with lecture method (2.521[a] for male and 2.527[a] for female) at the two levels of gender (male and female respectively). This implies that TPSCLS enhanced both the male and female students' interest scores in organic chemistry than that of their counterparts taught with lecture method. Nevertheless, the inferential statistics of ANCOVA will reveal if the interaction is significant.

The hypotheses 1, 2 and 3 were tested using ANCOVA. Summary of the analysis for the three null hypotheses is shown in Table 4.

Hypothesis 1: There is no significant difference between the mean interest score of SS2 students taught organic chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS) and their counterparts taught with lecture method.

Hypothesis 2: There is no significant difference between the mean interest scores of male and female SS2 students taught chemistry using the Think-Pair-Share Cooperative Learning Strategy (TPSCLS)

Hypothesis 3: There is no significant interaction effect of Think-Pair-Share Cooperative Learning Strategy (TPSCLS) and gender on students' mean interest score in organic chemistry.

These three hypotheses were tested using ANCOVA. Summary of the analysis for the two null hypotheses is shown in Table 4.

Table 4: *Analysis of co-variance for students' overall organic chemistry interest scores by teaching strategies (TPSCLS & LM) and by gender*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	25.169[a]	4	6.292	571.138	.000	
Intercept	1.629	1	1.629	147.817	.000	
PRE_INTRST	.017	1	.017	1.512	.222	
GENDER	**2.295**	**1**	**2.295**	**.000**	**.989**	**NS**
GROUP_TPS	**18.108**	**1**	**18.108**	**1643.635**	**.000**	**S**
GENDER * GROUP_TPS	**.001**	**1**	**.001**	**.077**	**.782**	**NS**
Error	.903	82	.011			
Total	815.547	87				
Corrected Total	26.072	86				

For hypothesis **1,** the ANCOVA table shows that the significant value of 0.000 is less than 0.05. The decision rule is to reject the null hypothesis when the sig. value is less than alpha value of 0.05. Since the sig. value is less than 0.05, the null hypothesis is rejected. The study concludes that there is a significant difference between the mean interest scores of students taught organic chemistry using TPSCLS and that of those taught organic chemistry using lecture method in favour of TPSCLS group.

For **hypothesis 2**, the ANCOVA table shows that the significant value of 0.989 is greater than 0.05. The decision rule is not to reject the null hypothesis when the sig. value is greater than alpha value of 0.05. Since the sig. value is greater than 0.05, the null hypothesis is not rejected. The study concludes that there is no significant difference between the mean interest scores of male and female students taught organic chemistry using TPSCLS. This implies that TPSCLS enhanced the interest of male and female students equally in organic chemistry.

For **hypothesis 3**, the ANCOVA table shows that the significant value of 0.782 is greater than 0.05. The decision rule is not to reject the null hypothesis when the sig. value is greater than alpha value of 0.05. Based on the decision rule, the researcher did not reject the null hypothesis and concludes that there is no statistically significant interaction between gender and teaching strategies on students' mean interest scores in organic chemistry. It implies that both male and female students taught with TPSCLS developed more interest in organic chemistry than both male and female students taught with lecture method. Therefore, gender did not influence the students' interest scores in organic chemistry.

Findings

This study recorded the following findings:

1. Students taught organic chemistry using Think-Pair-Share Cooperative Learning Strategy (TPSCLS) had higher mean interest scores than those taught using the Lecture Method (LM) and the difference in their mean

interest scores were statistically significant. TPSCLS was superior to the lecture method in enhancing the interest of the learners in organic chemistry. This is in line with recent research of Eze, Egbo & Okechineke (2024), advocating the inclusion of learner-centered strategies into the learning curriculum which can be used to arouse interest in a subject). The findings of this study is in line with the Structure-Process-Outcome Theory which revealed that students' exerting effort to complete the learning task, reflecting interest in completing the task successfully, focus on the task, curiosity about the task and its content, persistence, and the use of cognitive strategies are dependent on the learner-centered strategy employed which TPSCLS is equally one of them.

2. There was no statistically significant difference in the mean interest scores of male and female students in organic chemistry when taught with the Think-Pair-Share Cooperative Learning Strategy (TPSCLS). The finding of this study revealed that male students taught organic chemistry using TPSCLS had equal interest score with their female counterparts. The finding is in line with Okechineke (2025), who revealed that there was no significant difference between the female and male students' personal interests in organic chemistry. But this finding is in contrast with that of Eze, Egbo & Okechineke (2024) whose findings on gender difference on interest for organic chemistry was in favour of male students. This implies that the benefits of TPSCLS in organic chemistry are equally accessible and effective for both genders.
3. There was no significant interaction between gender and teaching strategies on the mean interest scores of the students in organic chemistry because both male and female students in the treatment (TPSCLS) group clearly had higher mean interest scores than those in the control (LM) group. This was evident in that TPSCLS is superior to lecture method at the two levels of gender (male and female). This underscores the consistency of the positive effect of TPSCLS across both male and female students in secondary school learning of organic chemistry, having positive impact on enhancing interest consistently for both male and female students. This finding reinforces the notion that TPSCLS is an effective teaching strategy that can be successfully implemented to enhance and sustain interest regardless of students' gender.

Conclusion

In TPSCLS lesson, all learners had equal chances of learning and constructing their knowledge. There was more interactive exchange of information than just giving formation. TPSCLS creates opportunities for a deeper sense of responsibility for student during the learning process. The activities allowed the students to learn concepts more

than contents and provided the opportunities for students to express free opinions with others by thinking, pairing and sharing their thoughts. Therefore, the students who learned through TPSCLS continuously encourage the active participatory process in constructing their knowledge. Furthermore, the finding of this study also revealed that male students taught organic chemistry using TPSCLS had equal interest score with their female counterparts. This implies that the benefits of TPSCLS in organic chemistry are equally accessible and effective for both genders. This result is important because it highlights the equality of educational opportunities provided by TPSCLS, eliminating any gender-based disparities in enhancing students' interest in organic chemistry. Finally, there was no significant interaction between gender and teaching strategies on the mean interest scores of the students in organic chemistry because both male and female students in the treatment (TPSCLS) group clearly had higher mean interest scores than those in the control (LM) group. This reveals the consistency of the positive effect of TPSCLS, having positive impact on enhancing interest consistently for both male and female students and reinforcing the notion that TPSCLS is an effective teaching strategy that can be successfully implemented to enhance and sustain interest regardless of students' gender. As the educational landscape continues to evolve, incorporating TPSCLS could be a strategic and beneficial move for secondary schools, fostering improved interest in organic chemistry.

Recommendations

In line with the findings of this study, the following recommendations were made:

1. Teaching and learning of organic chemistry through TPSCLS were observed and it was found that most students were very interested in doing activities, enthusiastic about doing group activities, had fun, and were happy because they did experiments and activities by themselves as well as working in groups with friends as they exchanged ideas. Therefore, teachers should apply these strategies for other contents and levels.
2. Facilitation of Collaborative Learning Opportunities: School management should foster a sense of community and collaboration among students through the use of TPSCLS. Implement discussion forums and interactive sessions to encourage peer-to-peer learning and engagement. Teachers should provide variety of activities and opportunities for students to use their skills continuously TPSCLS.
3. The results of this study show that students who were taught organic chemistry with TPSCLS attained higher interest score than students who were taught using lecture method. Hence, teachers should employ TPSCLS in teaching in order to both arouse and sustain the interest of the students in organic chemistry.
4. Students' gender should be taken into cognizance during teaching especially when teaching organic chemistry. The findings of this study

revealed that gender was a significant factor in mean interest scores of students; hence, teachers should use instructional strategies that can streamline gender differences in science classrooms.

5. Professional Development for Educators: government should provide continuous professional development opportunities for science teachers on how to use TPSCLS and other innovative student-centered instructional strategies in teaching to enhance their skills in utilizing TPSCLS effectively, irrespective of gender. This can be done by organizing periodic workshops and seminars for teachers.

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