

EFFECT OF THINK-PAIR-SHARE STRATEGY ON ACADEMIC PERFORMANCE AND RETENTION OF SECONDARY SCHOOL CHEMISTRY STUDENTS IN KATSINA STATE, NIGERIA

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Abstract

The study examined effect of think-pair-share strategy on academic performance and retention of secondary school chemistry students in Katsina state. The study has 2 research objectives with corresponding research questions and hypotheses. The study adopted a quasi-experimental research design with pre-test, post test and post post-test experimental and control groups. The target population for the study was 1410 students in the public secondary schools in Katsina state. Sample of 80 students were selected for the study. Chemistry Performance Test (CPT) was used as instrument for data collection. The instrument was validated by experts in curriculum, chemistry and measurement and evaluation. Using test retest method, the instrument yielded reliability coefficient of 0.74. Mean and Standard deviation were used to answer the research questions while t-test was used to test the hypotheses. The findings of the study revealed that there was significant difference among the mean performance and retention scores of chemistry students taught using think-pair-share strategy compared to those taught using lecture strategy. Based on the findings, it was concluded that the use of think-pair-share strategy has positive effect on students' performance and retention among chemistry students compared to those taught using lecture strategy. It was recommended that chemistry teachers in senior secondary schools should be encouraged to use this strategy in classroom as it improves students' performance and retention in chemistry.

Keywords: Think-pair-share strategy, Academic Performance, Retention, Chemistry.

Introduction

Chemistry is the study of composition, properties, synthesis and use of matter. Chemistry as a field of study is interested on how different substances react with one another and the suitable conditions for these reactions. The science of chemistry is concerned with studying the atomic and molecular structure of matter to identify the properties of matter quantitatively (Ababio, 2011). It probes into obtaining new beneficial products that can be used in medicine, agriculture, engineering and industry. Chemistry is one of the science subjects studied in secondary schools in Nigeria. Secondary school chemistry teaches the basics to the

understanding of chemistry and also prepares students who want to study chemistry in a future or higher level. Chemistry is also concerned with treating some environmental problems such as rust, pollution of air, water and soil, the shortage of water and the energy resources. Since the ancient civilization, chemistry has been related to metals, mining, production of colours, medicine and some technical industries like tanning, dyeing clothes and production of glass (Ababio, 2011).

Think-Pair-Share (TPS) is a cooperative learning strategy that encourages students to work together to solve problems or answer questions on an assigned topic (Andrew & Alexandria, 2015). Think-pair-share as the name goes involves the students in thinking about challenging academic tasks given by the teacher individually, pairing with other students to exchange ideas and sharing the idea with the larger class. In the think-pair-share classroom, every student is an active learner. The teacher in this study used think pair share by developing a number of questions related to the objectives of the instruction and challenging the students to provide answers. The teacher will produce a chart of students seating arrangement so that students cannot chose the same person or their friends only by adhering to the chart. Using the chart, students are made to pair with a different student for each question to facilitate greater interaction. During the interaction among pairs, students are expected to bring to the pair learning what they think is the solution to the problem, for which the teacher have given them time to think before pairing. The students' pairs are to examine each others solution to the problem, criticize or add to the solution or learn from it. Students in their pair may choose to solve the problem together with the ideas they have previously thought on their mind. This collaboration to solve a problem must result in a possible or at least tentative solution to the problem, which the students may now share with the entire class. The teacher appoints students at random looking at the chart to ensure that all the students are involved and that the intelligent ones do not dominate the activities. After the sharing, the teacher summarizes the lesson in the order of what students are supposed to learn. Learning through think-pair-share shows that, by the intrinsic nature of the learning strategy, students can learn from their peers. It affords slow pace learners and shy students the opportunity to build self-confidence by learning from their peers (Marvin, 2015).

Think-Pair-Share also improves students' desire to learn seeing that the task of learning is a collaborative effort where students can improve understanding of chemistry concept by sharing ideas. The thinking part of think pair share (TPS) facilitates students' active cognitive engagement in learning and reduces absent mindedness during instruction. Think pair share (TPS) afford students the opportunity to take active role in their own learning through cognitive engagement, peer learning and sharing. 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. These features of think pair share bear good and positive prospect for the students' achievement in chemistry.

The conventional method of teaching is what the teacher does in the classroom (Millis, 2012). Since most teachers use a mixture of different methods of instruction, one cannot really place the method of instruction adopted by the teacher in a conventional method class. However, most of the conventional methods are often teacher-centred. The conventional teaching methods have been shown to have no serious and positive effects on students' academic achievement in chemistry, hence, the persistently low achievement in teaching chemistry. There is need therefore, for chemistry teachers to adopt innovative teaching strategies in the teaching and learning of chemistry that could improve achievement irrespective of students' gender.

Ogunbameru (2015) discovered that the traditional methods like lecture method, are still heavily used to teach subjects in most Nigerian schools especially in secondary schools. In this method of teaching the learners are passive and submissive to the teacher as they rigidly and religiously follow the teacher's directives. Amadi (2014) opined that the uninspiring lecture teaching methods adopted by chemistry teachers lead not only to low performance but also incapacitates students from developing required skills necessary for creative thinking. In this method, the teacher presents a verbal discourse on a particular subject, theme or concept to the learners, the teacher deliver pre-planned lessons to the students with little or no instructional ideas. Most of the time, during teaching- learning process, instruction remained unilateral which is considered to be orthodox activity. Think-pair-share methods of teaching are considered more effective alternative to traditional/conventional or teacher centred methods. Think-pair-share method is student (learner) centred approach that is taught through many different activities (Doris 2013). In this method of teaching, the students or learners are more active than the teacher as they investigate, explore, interact, question and apply knowledge (Anyanwu et al 2009). It promotes better understanding of a lesson as it is learning by doing. Ethics are usually formed when using activity-based. It enhances self-efficacy in the learner. It gives learners opportunities to work independently and in group. It inspires the students to apply their creative ideas, knowledge and minds in solving problems (Doris 2013). The activity based teaching methods makes the teaching and learning practical and meaningful to the learners which may encourage high level of knowledge retention amongst learners. A common example of an activity-based method of teaching is the think pair share and blended learning methods.

Academic performance refers to the extent to which students, teachers and the institution of learning has been able to attain short and long term educational objectives and goals. The term is a compound one, because it encompasses all factors that play a role in the academic outcome of a learner. These factors may include: motivation, attitude, interest, skills, method of teaching and the like.

Bichi (2002) explained retention as the ability to store and remember things experienced or learned by an individual at a later time. It entails ability to recall facts and figures in memory or recognize what has been learnt. Ochoonogor (2007) stressed that retention can be measured

through verbal recall of learnt materials and explained that concepts learnt assist in reflective thinking and that retained concepts can be used in creative way to solve new problems.

Statement of the Problem

With the growing trend of information and communication technology, the traditional lecture method may no longer be adequate for teaching chemistry. The knowledge of chemistry equips the child with necessary skills needed for solving related problems in his daily activities. The importance of chemistry in everyday living cannot be overestimated. The chemistry curriculum in Nigeria secondary schools is developed, structured and retention in chemistry especially at senior secondary school level has been observed to be consistently poor. This poor achievement has been linked to the poor teaching strategies employed by teachers in the classroom. Thus, these poor teaching strategies have been attributed to the constant use of lecture teaching methods (talk and chalk method) in teaching and learning chemistry. Again, chemistry as a science subject is practically oriented; hence there is the need to use learner-centred innovative strategies such as the think pair share and blended learning strategies.

Nghambi (2014), and Afriani (2020) stated that, non-use of appropriate teaching methods, inadequate supply of teaching materials and learning processes, insufficient teacher training, inappropriate government policies and lack of care from parents for their children are several factors causing students to have poor academic performance. In recent years, educational systems in many countries experienced tremendous and rapid change. This change is as a result of teaching and learning strategies being structurally modified (Brien, 2005). The modification leads to the development and introduction of new teaching and learning method or strategies. Some of these methods allow the instructors and learners to focus on their roles, and most strategies are student- centred while some are teacher centred.

Objectives of the Study

Therefore, the following objectives guided the study to:

1. Determine the effect of think-pair-share strategy and the lecture strategy on students' academic performance in chemistry among secondary schools in Katsina state.
2. Find out the effect of think pair share strategy and the lecture strategy on students' retention in chemistry among secondary schools in Katsina state.

Research Questions

The following research questions guided the study:

1. What is the effect of think-pair-share strategy and the lecture strategy on students' academic performance in chemistry among secondary schools in Katsina state?
2. What is the effect of think-pair-share strategy and the lecture strategy on students' retention in chemistry among secondary schools in Katsina state?

Hypotheses

The null hypotheses of the study are as follows:

HO₁. There is no significant difference in students' academic performance taught chemistry using think-pair-share strategy and those taught using lecture strategy among secondary schools in Katsina State.

HO₂. There is no significant difference in students' retention taught chemistry using think-pair-share strategy and those taught using lecture strategy among secondary schools in Katsina State.

Methodology

This investigation adopted a quasi-experimental research design which was used to collect data on the effect of think-pair-share strategy on academic performance and retention of secondary school chemistry students in Katsina state. The study population consisted of 1410 students in Katsina Education Quality Assurance Zones. The sample of 80 students was selected. Chemistry Performance Test was used as instrument for data collection. The CPT consisted of 30 test items. The instrument was validated respectively by experts in curriculum, chemistry and educational measurement and evaluation. A pilot test was conducted to determine the reliability of the instrument. The statistical tool used for the internal consistency was test retest method. A reliability coefficient of 0.74 was obtained. Mean and standard deviation were used to answer research questions while t-test was used to test the hypotheses at 0.05 level of significance.

Results

Research Question One: What is the effect of think-pair-share strategy and the lecture strategy on students' academic performance in chemistry among secondary schools in Katsina state?

Table 1: Performance mean and standard deviation for experimental group and control group

	Group	N	Mean	Std. Deviation	Mean Difference
POSTTEST	Experimental	45	44.80	13.090	1.086
	Control Group	35	43.71	15.514	

Results in table 1 indicates that the students taught using think-pair-share strategy had a mean score of 44.80, while students taught using lecture strategy had a mean score of 43.71 with corresponding standard deviation of 13.80 and 43.71 respectively This implies that students taught using think-pair-share strategy had a higher mean score and a mean difference of 1.086 over those taught using lecture strategy.

Research Question Two: What is the effect of think-pair-share strategy and the lecture strategy on students' retention in chemistry among secondary schools in Katsina state?

Table 2: Delayed posttest mean and standard deviation for experimental group and control group

	Group	N	Mean	Std. Deviation	Mean Difference
DELAYED	Experimental	45	56.20	12.906	9.143
POSTTEST	Control Group	35	47.06	14.864	

Results here indicated that the students taught using think-pair-share strategy had a retention mean score of 56.20, while students taught using lecture strategy had a retention mean score of 47.06 with corresponding standard deviation of 12.906 and 14.864 respectively. This implies that students taught using think-pair-share strategy had a higher retention mean score and retention mean difference of 9.143 over those taught using lecture strategy.

H0₁: There is no significant difference on students' academic performance taught chemistry using think-pair-share strategy and those taught using lecture strategy among secondary schools in Katsina state.

Table 3: Summary of independent sample t-test analysis of experimental group and control group

Group	N	Mean	Std.D	M.D	df	t- cal	P-value	Remark
Experimental	45	44.80	13.09					
				1.086	78	.339	.735	Not sig
Control	35	43.71	15.51					

$\alpha \leq 0.05$

Table 3 shows that experimental group has a mean score of 44.80 and standard deviation of 13.09 while the control group has a mean score of 43.71 and standard deviation of 15.51. This therefore indicated that there is no significant difference between the mean performance scores of senior secondary students taught Chemistry using think-pair-share strategy and those taught using lecture strategy. This was because the P-value .735 is greater than 0.05 alpha level of significance and df at 78. It was found that think-pair-share strategy increased performance of students more than the lecture strategy. Therefore, the null hypothesis which states that, there is no significant difference between the mean performance scores of students taught Chemistry using think-pair-share strategy and those taught using lecture strategy was accepted.

H0₂: There is no significant difference on students' retention taught chemistry using think-pair-share strategy and those taught using lecture strategy secondary schools in Katsina state.

Table 4: Summary of independent sample t-test analysis of experimental group and control group

Group	N	Mean	Std.D	M.D	df	t- cal	P-value	Remark
Experimental 1	45	56.20	12.91					
				9.14	78	2.941	.004	Sig
Control	35	47.06	14.86					

$\alpha \leq 0.05$

Table 4 shows that experimental group has a mean score of 56.20 and standard deviation of 12.91 while the control group has a mean score of 47.06 and standard deviation of 14.86. This therefore reveals that there is significant difference between the retention scores of senior secondary students taught Chemistry using think-pair-share strategy and those taught using lecture strategy. . This was because the P-value .004 is less than the 0.05 alpha level of significance and df at 78. Given this result, it is established that think-pair-share strategy has higher retention on students more than lecture strategy. Therefore, the null hypothesis which states that, there is no significant difference on students retention taught Chemistry using think-pair-share strategy and those taught using lecture strategy was rejected.

Discussion of the Findings

There was no significant difference on students' academic performance taught chemistry using think-pair-share strategy and those taught using lecture strategy among secondary schools in Katsina State. As indicated by the results from the analysis shows that the experimental group with a mean score of 44.80 performed significant better than the control group which has a mean score of 43.71. This evidence suggests that think-pair-share strategy is more effective than the lecture strategy. The findings is in support with that of Alabi and Sani (2020) who revealed that there was no significant difference in the performance of students taught English language using think-pair-share strategy and lecture strategy, female students performed better than the male students when taught English language using think-pair share strategy. It was also in support with the findings of Hadiza & Suwaiba (2023) which confirmed that students taught using think-pair-share strategy performed better than those taught using lecture strategy. There was no significant difference on students' retention taught chemistry using think-pair-share strategy and those taught using lecture strategy among secondary schools in Katsina State. From the analysis it shows the delayed posttest score of chemistry students taught using think-pair-share strategy and those taught using lecture strategy among secondary schools in Katsina State. It shows that experimental group has a mean score of 56.20 increased students' retention more than the control group which has a mean score of 47.06

Similarly the finding of Adekunle (2015) in his study, it was observed that students taught using think pair share & guided discovery strategies obtained significantly higher post-test mean scores than those in the lecture strategy. The findings is in disagreement with similar studies of Marwan, (2015) which revealed that there was no significant difference in the post-test performance mean score of the experimental and control group. This means that students taught using think pair share performed significantly higher from those taught using traditional strategy.

Conclusion

Based on the findings, the study concluded that the use of think-pair-share strategy was found to be more effective in enabling students achieve higher level of retention ability in chemistry than the use of the lecture method.

Recommendations

Based on the findings and the conclusion drawn the following recommendations were made:

1. Teachers of chemistry at senior secondary schools of Katsina state should do better to adopt the use of think-pair share strategy in teaching and learning chemistry concepts.
2. Government should encourage professionalism in teaching by organizing in-service training workshops and seminars and conferences for teachers so as to keep them abreast on the usefulness of think-pair share instructional strategy in achieving effectiveness in learning at senior secondary schools.

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