

Enhancing Science Performance through Think-Pair Strategies among College of Education Students in Integrated Science in Ekiti State, Nigeria

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Abstract

This paper examined the effects of think-pair share strategies on college of education students' class participation and performance in Integrated Science in Ekiti State. The study adopted a quasi-experimental pre-test, post-test, control group design. Four null hypotheses were generated and tested at 0.05 level of significance. The sample consisted of 90 Integrated Science students selected from part two (2017/18 academic session) through simple random sampling technique. The instrument that was used for the study was Integrated Science Achievement Test (ISAT). It is a self-designed instrument that consisted of information on bio-data of the respondents and 40 multiple-choice items. Expert judgments were used to ensure face and content validity. Test-retest method was used to determine the reliability and reliability Coefficient of 0.72 was obtained. The data were analyzed using inferential statistics of t-test. The study found out that there was a significant difference between the posttest means scores of students exposed to think-pair share and conventional strategies. It was also revealed in the study that there was no significant difference between the posttest means scores of male and female students exposed to think-pair and conventional strategies. Based on this finding, it was recommended among other things that integrated science lecturers should adopt think-pair share strategy in lecture rooms to enable students participate actively and interact to arouse their interest and improve performance.

Keywords- *Think-Pair Share, Class Participation, Performance, Integrated Science, College of Education students*

Introduction

The importance of science and technology to national development in the life of any country cannot be overemphasized. This is because knowledge and skills in science and technology are very vital in the development of any society. The future of our society will be determined by citizens who are able to understand and help shape the complex influences of Science and technology on our world (Ungar, 2010). Consequently, Nigeria's educational policies and programs are being directed toward the sciences and integrated Science as the core and foundation of science which is the pivot on which other Science subjects revolve. Understanding the content and processes studied by science is crucial for the understanding of numerous challenges of modern society – new technologies and sustainable development (Özdem et al., 2010).

It seems that to increase students' interest, participation and competence in the field of science, we need to develop and accept a different approach to teaching science. In the past, a student's success was based on the amount of information they could memorize, however in today's information age, conceptual knowledge is more important, (Huitt, 2007). It is therefore more pertinent that we should continue to seek for methods and variables which would improve

students' mastery of the subject and consider some strategies especially those that have to do with peer learning. To respond to these challenges against traditional teaching approach, i.e., deductive, top down teaching (from conclusions to the experiment), educational science is developing new, student-oriented teaching paradigms (inductive approach, directed from the research to the conclusions) – e.g., problem-based learning (PBL), inquiry-based science education (IBSE), constructivist and project learning (IAP, 2010).

According to Holbrook (2010), who opined that different approaches were developed which explored ideas for making science subjects better appreciated by students, by raising popularity (liked by majority of students) and relevance (sense of usefulness of the learning) of science education. What all modern approaches have in common is the student active engagement in the classes (in mental and physical terms), which is regarded as a condition essential for developing interest, understanding and long-term knowledge. By student's mental active class engagement we mean classes in which the teacher initiates the subject through problems of everyday life or performing experiments with everyday objects, thus motivating students to relate their experience with the subject and sense the relevance of the knowledge they are about to gain; by physical active engagement we mean the class that is performed without students undergoing physical restraints (of sitting in one place) and allowing the students to experiment themselves. In this sense, active learning and active lessons are considered to be the approaches to teaching and learning that encourage higher level of student independence and apply different thinking strategies and specific cognitive skills which enable the distinguishing of important information, their analysis and comparison, as well as connection to the previous knowledge and critical judgment.

Ajiboye and Ajitoni (2008) observed that children learn best by being interested fully in their own work, by seeing themselves, doing themselves, by puzzling themselves, by verifying their own suppositions; by experimenting themselves, by drawing conclusions themselves on the strength of evidence which they have collected themselves. They can always make mistakes which they then should rectify themselves in the light of new information and evidence that they have uncovered themselves. This pedagogic concept should be participatory through social interaction, togetherness, and action-oriented communication. Think-pair share strategies belong to these pedagogic concepts. Think – Pair – Share Strategy is one of group discussion strategies and diverse methods of learning collaboratively. This method was developed by Kagan (1991) when Kagan made a repertoire of free content activities. As the teacher works to choose appropriate content, and it is the whole lesson preparation and formulation of cognitive objectives, the cooperative which form the basis, fall into this way (Think – Pair – Share) Strategy Which in turn will help learners to think by giving them time to think, being more willing and less apprehensive about sharing with a larger group, and it gives them time to change their response if needed and reduce the fear of giving the wrong answer thereby encouraging them to participate cooperatively, mutual learning between individuals, and ensure that the contribution of each student work (Bamiro, 2015).

Think-pair-share is a cooperative learning strategy that includes three components namely, time for thinking, time for sharing with a partner, and time to share among pairs to a larger group. The use of the strategy unites the cognitive and social aspects of learning, promoting the development of thinking and the construction of knowledge. Think-pair share strategy has many advantages over the traditional questioning structure. The “think time” incorporates the important concept of “wait time.” It allows all students to develop answers, longer and more elaborate answers can be given, and answers will have reasons and justifications because they have been thought about and discussed. Students are more willing

to take risks and suggest ideas because they have already “tested” them with their partner. Strategic steps of (Think – Pair – Share) posed some of the questions to the class about what has been explained about the activity or an issue or a task and then ask the students to think for a minute about this question alone with the prevention of talk or walk around in the classroom at the time of thinking, then the teacher asks students to split up into pairs to discuss and think together about a question or posed activity for a period of five minutes, finally the teacher is required to participate by displaying what has been reached of solutions and ideas about the question or activity and it is characterized by giving the students an opportunity to reflect (with himself internally and externally with colleagues) and thinking and revision before answering (Zaitun, 2007).

Strategic steps of (Think – Pair – Share)

(Think – Pair – Share) Strategy comes according to the following steps:

The first step: thinking step

(Think – Pair – Share) Strategy started when the teacher is offering a question exciting to think or a problem related to the topic of the lesson to search for a solution Then the teacher ask the students to think alone to resolve the issue or problem at hand and give them a specific time to think and the time is determined for individual reflection on the basis of students' knowledge and the nature of the question and the degree of complexity.

The second step: pairing step

The teacher asks from students to split up into pairs and discusses what they think about it where each student discusses and share ideas reached by thinking step with his colleague who sits next to him and each of them is trying to make his/her point to colleague, convince them and exchange views and ideas to reach a common answer.

The third step: Sharing step

The teacher can participate each pair of students with another pair of students to think together and this will save time and effort on the teacher, Rather the teacher discusses with (20) pairs of students, for example, will be discussed (10) groups at the same time (Saleh and Ibrahim, 2015). Think – Pair – Share Strategy is modern teaching strategies which is aimed to provide students the achievement and aims to stimulate their energies and develop their abilities. It is also suitable for students of all ages and those engaging in cooperative learning for the first time (Ahmed, 2016).

In view of Ruiz (2011) who opined that in addition to the benefits gained through cooperative learning and increased wait time, the aspect of formative assessment that the think-pair-share strategy provides is valuable to the learning process. Using think-pair-share allows the teacher to gain insight into the quality of student understanding. When teachers are able to gauge their students' understanding, they can use this information to alter their instruction in a way that would be more beneficial to learners. Informal formative assessment describes the process of teachers gaining new information about student understanding and using that information to immediately shape the instruction in order to better facilitate student learning. Informal formative assessment can occur the during student-teacher or student-student interaction that takes place during think-pair-share. These interactions allow teachers the opportunity to observe students' thinking through their explanations and dialog.

According to a study conducted by Connelly (2010) who posited that apart from change in academic achievement, class wide peer tutoring also enhanced student motivation

and promoted comprehension. In view of Goodings and Merz's study (2011), students' attitudes towards Sciences changed completely after participating in the small peer-led collaborative groups but gender had no significant contribution. For example, the group leaders enhanced their personal and academic skills and all the students started to spend much more time irrespective of gender differences. Supportively, Yardim's study (2009) showed that after participating in the small peer-led collaborative groups, students' attitudes towards sciences changed completely. He asserted that the interactions among students enhance their personal and academic skills due to more time spent together and all the students started to spend much more time in or out of class. He also opined that it is important for instructors to be aware of student's beliefs when teaching in the traditional platform, the teacher is at the front of the classroom and the students are left to passively observe. This may not give the students the opportunity to express what they know until it is test day. In view of these; we should therefore continue to seek strategies which would improve students' mastery of the subject as well as their academic performance in schools.

Statement of the Problem

The poor performance of some undergraduates in Nigeria has been widely reported. The reality of science teaching suffers many obstacles in achieving the educational goals; we often hear complaints in the teaching of science in our higher institutions and traditional lecture methods still based on conservation and indoctrination are prevailing, which resulted in a decrease in the level of participation and performance among students. It is also observed that the performance of many students in higher institutions is not encouraging due to inappropriate instructional strategies which do not allow the students to be actively involved in the lectures (Ali, 2013). The students just listen to lecturers without concentration or distracted by some factors that may result in reduced participation and low performance. These situations seem to have diverse effects on the effective teaching and learning of Science. It is against these mentioned observations that this research was carried out to investigate the effects of think-pair share strategies on college of education students' class participation and performance in Integrated Science in Ekiti state.

Purpose of the Study

The purpose of this study was to examine the effect of using think-pair strategies to enhance College of Education students' performance in Integrated Science in Ekiti State. The study also intends to examine possible effect of gender on college students' performance in Integrated Science. The outcome of this effort will be used to suggest steps that can enhance and improve Science performance.

Research Hypotheses

The following null hypotheses were generated and tested;

1. There is no significant difference between the pretest mean scores of subjects exposed to the think-pair share strategies and conventional strategies
2. There is no significant difference between the posttest mean scores of students exposed to think-pair share strategies and conventional strategies.
3. There is no significant difference between the posttest mean scores of male students exposed to the think-pair share strategies and conventional strategies.
4. There is no significant difference between the posttest mean scores of female students exposed to the think-pair share strategies and conventional strategies

Methodology

The study was a quasi-experimental pre-test, post-test, control group design. The pre-test was

to establish the knowledge base line of the students that was used for the study while the post-test will measure the level of academic performance of the students after treatment. In this study, two already existing, or intact groups were used, one of them as the experimental group and one of them as the control group.

The design of the study is given as follows:

Experimental Group = $O_1 \quad X_1 \quad O_2$ and Control Group = $O_3 \quad X_2 \quad O_4$. Where O_1, O_3 , represent pre-test. X_1 = Think-pair share strategies, X_2 = Conventional method. Also, O_2, O_4 , represent post-test. The population of the study consisted of all Integrated Science Students in College of Education, Ikere-Ekiti, who are in the second years of the study (N.C.E Part2) for 2017/18 academic session. They are made up of boys and girls from the department. The total number of part II for the session is 140. The total number of boys is 60 and that of girls is 80. The sample for this study consisted of 70 Integrated Science students selected from part two (2017/18 academic session) through simple random sampling. Proportional random sampling was also used to select 30 boys and 40 girls to ensure gender equality. The instrument that was used for this study is Integrated Science Achievement Test (ISAT). It is a self-designed instrument. Section A of the ISAT consisted of information on bio-data of the respondents while Section B consisted of 40 multiple-choice items that covers all the content of the chosen topics used as achievement test. Expert judgments were used to ensure face and content validity. Test-retest method was used to determine the reliability and reliability Coefficient of 0.72 was obtained.

Results

H1: There is no significant difference between the pretest mean scores of students exposed to think-pair share strategies and conventional strategies

In testing this hypothesis, the mean total score and standard error obtained from the pretest mean scores of students exposed to think-pair share strategies and conventional strategies were subjected to t-test analysis at 0.05 level of significance.

Table 1: The t-test showing the pretest mean scores of students exposed to think-pair share and conventional strategies.

Group	N	Mean	SD	df	t-cal	t-table	Result
Think-pair share	35	27.33	10.40	78	4.39	1.96	Significant at $p < 0.05$
Conventional method	35	13.63	16.24				

Table 1 shows that the mean score of students exposed to think-pair strategies is 27.33 with standard deviation of 10.40, while the mean score of students exposed to conventional method is 13.63 with standard deviation of 16.24. The t-calculated is 4.39 while the t-table is 1.96. Thus the t-calculated is greater than the t-table value; therefore, the null hypothesis is rejected.

H2: There is no significant difference between the posttest mean scores of students exposed to think-pair strategies and conventional strategies.

In testing this hypothesis, the mean total score and standard errors obtained from the posttest mean scores of students exposed to think-pair share and conventional strategies were subjected to t-test analysis at 0.05 level of significance.

Table 2: the t-test showing the posttest mean scores of students exposed to think-pair share strategies and conventional strategies.

Group	N	Mean	SD	df	t-cal	t-tab	Result
Think-pair share	35	11.46	3.71	78	14.21	1.96	Significant at $p < 0.05$
Conventional method	35	7.66	2.85				

Table 2 shows that the mean score of students exposed to think-pair share strategies is 11.46 with standard deviation of 3.71, while the mean score of students exposed to conventional method is 7.66 with standard deviation of 2.85. The t-calculated is 14.21 while the table value is 1.96. Thus, the t-calculated is greater than t-table value; therefore, the null hypothesis is rejected. This implies that there is a significant difference between posttest means scores of students exposed to think-pair share strategies and conventional strategies.

H3: There is no significant difference between the posttest mean scores of male students exposed to think-pair share strategies and conventional strategies. In testing this hypothesis, the mean total score and standard error obtained from the posttest mean scores of male students exposed to think-pair share and conventional strategies were subjected to t-test analysis at 0.05 level of significance.

Table 3: The t-test showing the posttest mean scores of male students exposed to think-pair share and conventional strategies.

Group	N	Mean	SD	df	t-cal	t-table	result
Think-pair share	15	49.33	18.64	33	1.87	1.96	Not Significant at $p < 0.05$
Conventional method	15	46.21	18.31				

Table 3 shows that the mean score of male students exposed to think-pair share strategies is 49.33 with standard deviation of 18.64, while the mean score of male students exposed to conventional method is 46.21 with standard deviation of 18.31. The t-calculated is 1.87 while the t-table is 1.96. Thus the t-calculated is less than the t-table value; therefore, the null hypothesis is not rejected. This implies that there is no significant difference between the posttest means scores of male students exposed to think-pair share strategies and conventional strategies.

H4: There is no significant difference between the posttest mean scores of female students exposed to think-pair share strategies and conventional strategies. In testing this hypothesis, the mean total score and standard error obtained from the posttest mean scores of female students exposed to think-pair share strategies and conventional strategies were subjected to t-test analysis at 0.05 level of significance.

Table 4: The t-test showing the posttest mean scores of female students exposed to think-pair share strategies and conventional strategies.

Group	N	Mean	SD	df	t-cal	t-table	result
Think-pair share	20	29.74	2.80	43	1.47	1.96	Not Significant at $p < 0.05$
Conventional method	20	27.54	2.84				

Table 4 shows that the mean score of female students exposed to think-pair share strategies is 29.74 with standard deviation of 2.80, while the mean score of female students exposed to conventional method is 27.54 with standard deviation of 2.84. The t-calculated is 1.47 while the t-table is 1.96. Thus, the t-calculated is less than the t-table value; therefore, the null hypothesis is not rejected. This implies that there is no significant difference between the posttest means scores of female students exposed to think-pair share strategies and conventional strategies.

Discussion

The finding of the study revealed in hypothesis 1 that there is significant difference between the pretest mean scores of students exposed to think-pair share strategies and conventional strategies. The study also revealed in hypothesis 2 that there is a significant difference between the posttest means scores of students exposed to think-pair share strategies and conventional strategies. This is in accordance to the submission of Yardım (2009), who asserted that small peer-led collaborative group increases the social interaction among students, hence affects the attitudes and performance of students positively. This was also supported according to a study conducted by Connelly (2010) that apart from change in academic achievement, class wide peer tutoring also enhanced student motivation and promoted comprehension. It was therefore found from the study that students exposed to think-pair strategies instruction performed better than those exposed to conventional lecture method. The study also revealed in hypothesis 3 and 4 that there is no significant difference between the posttest mean scores of male and female students exposed to think-pair strategies and conventional strategies. This was in accordance with Goodings and Merz's study (2011), that students' attitudes towards sciences changed completely after participating in the small peer-led collaborative groups but gender had no significant contribution. This is an indication that gender has no significant contribution because male and female students exposed to the same treatment have nearly same scores in the test.

Conclusion

Based on the findings of this study, it was found that think-pair share strategy was more effective in teaching Integrated Science than the conventional method. The think-pair share strategy allows students to construct their own meanings and scaffold what they are learning with their peers, therefore has the potency of producing higher students' performance. It was also discovered that sex does not play any significant role in students' performance. Male and female students exposed to same treatment did not differ significantly in their performance.

Recommendations

Based on the findings, the researcher considers the following recommendations necessary:

1. The College management should organize seminars at intervals for Integrated Science lecturers to update their knowledge on the application of the think-pair share strategies.

2. Integrated Science lecturers should adopt think-pair share strategy in lecture rooms to enable students participate actively and interact to arouse their interest and improve performance.
3. Government should provide enabling environment for lecturers and making the school conducive for participatory studentship.

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