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EFFECTS OF THINK-PAIR-SHARE COLLABORATIVE INQUIRY AS ONE OF CLASSROOM PRACTICES FOR IMPROVING STUDENTS' REFLECTIVE THINKING SKILLS IN BASIC SCIENCE

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Abstract: *Reflective thinking occurs at all stages of teaching process, in planning, action (execution) and in evaluation. The skills involved had not been developed in Junior secondary schools in Nigeria. There is the need to equip our students with this skill, hence the research focused on the effects of Think-Pair-Share collaborative inquiry as one of classroom practices for improving students' reflective thinking skills in Basic Science. The study further investigates the moderating effects of numerical ability on the dependent measure 294 students from nine intact classes were selected from Three local governments for the study. Instruments used in the study were: Students Basic Science Reflecting Thinking Achievement Test (SBSRTAT), Numerical Ability Test (NAT), Instructional Guide on Think-Pair-Share Strategy in Basic Science (IGTPSBS).,Instructional Guide on Conventional Strategy in Basic Science (IGACSBS).,ESATPS on Think-Pair-Share on Modified Conventional Strategies. Data were analysed using ANCOVA. There was a significant effect of treatment on students reflective thinking achievement in Basic science ($F_{(2, 294)}$= 56.149; p<.05). This means that there is significant difference in the posttest Reflective thinking achievement scores of those in the Think-Pair-Share and those in the control group. Think-Pair-Share Strategy is recommended to teachers for the teaching of Basic Science for better reflective thinking achievement.*

Keywords: Think-Pair-Share, Reflective Thinking Skills, Conventional Strategy, Basic Science.

Introduction

It is obvious that science and technology education plays a key role for the futures of societies and because of its importance, all societies and particularly developed countries have continuously sought to improve the quality of science and technology education. The knowledge of science is used in the production of materials that, reduce stress, suffering, and hunger in people as well as make life enjoyable and secure. It is also a necessary factor for the economic development of a nation (Adepitan, 2003; Olagunju, Adesoji, Iroegbu and Ige, 2003). It therefore implies that, for any meaningful national growth and development to be achieved, Science and Technology must be essential parts of the Nations culture (Adeniyi, 2005, Ige, 2003) Science is also one of the ways man searches for the truth and achieves understanding of his or her environment and the universe. The Basic Science and Technology Curriculum (Revised 2012) is expected to enable the learners.

(i) Develop interest in science and technology;
(ii) Acquire basic knowledge and skills in science and technology
(iii) Apply scientific and technological knowledge and skills to meet contemporary societal needs;
(iv) Enjoy numerous career opportunities provided science and technology;
(v) Become prepared for further studies in science and technology
(vi) Avoid drug abuse and related vices; and
(vii) Be safety and security conscious.

Findings of various researchers revealed that, the instructional strategy used also significantly influence students' academic achievement in science (Oshodi 2006). For effective teaching and learning, a single strategy is inadequate, however, studies reveal diverse strategies for Basic Science: instructional strategies (Bolorunduro, 2005); Jigsaw II Instructional Strategy (Olaniyi 2009) Multiple Intelligence Teaching Strategies Duru and Okeke, (2010) and Agoro 2012 suggested the use of other methods that could promote effective Basic Science delivery as crossword-picture also Olagunju, Busari and Ogunbiyi (2004) also emphasized the importance of peer group in secondary schools for teaching-learning process. These strategies encouraged student-student interaction thus making students learn better from each other. Regardless of all these efforts and teaching innovations at ensuring qualitative teaching and learning of Basic Science at Junior Secondary school level, evidences have show that students learning outcomes still remains not so encouraging (Adeyemi, 2006; Ajagun, 2006 and Ozoji, 2008). These are the conflicting findings necessitate further studies on effects of Active Review and Practice-invention strategies on students' achievement, attitude and science process skills efforts towards the challenge of students' annual poor performance in JSSCE in Basic Science have not recorded substantial outcomes to the level of solving the academic problem. It is within this premise of this situation that the researcher investigated efforts of Active Review and Practice-Inventions strategies on students achievement, attitude and process skills in Basic Science.

The result of JSSCE Basic Science result of 2008 to 2013 shows increase in rate of failure of students in Basic science.

Table 1: Summary of Junior Secondary School Certificate Basic Science Examination Result for Oyo State 2008-2013

Year	Total Candidates	A – C Higher passes	% of Higher passes	% poor passes	% of poor passes	F failure	% of failure	P – F cumulative	% of poor and outright failure
2008	80,070	59,683	74,54	14,138	17,66	6,249	7.80	20,387	25.46
2009	85,034	47,087	55.37	29,935	35,20	8,012	9.43	37,947	44.63
2010	80,355	61,508	76.55	18,081	22,50	766	0.95	18,847	23.45
2011	75,437	44,479	59.26	15,640	20.73	9,603	12.73	25,243	40.74
2012	89,047	52,899	58.41	25,466	28.60	10,682	12.00	36,148	41.59
2013	78,733	49,132	59.86	20,723	26.32	10,878	13.82	31,601	40.14

Source: Oyo State Ministry of Education, Evaluation Department, 2014.

Table1: Shows students' performance in Oyo State Junior Secondary School Certificate Examination in Basic Science. Going through the percentages of failure rate from (2008 to 2013), it was discovered that the failure percentage rate in year 2009, 2011, 2012 and 2013 gradually increased though there were noticeable improvements in 2008 and 2010. With more effort on the part of the teachers, the parents, the government and the students themselves a greater performance in Basic Science subjects can be achieved. This will increase the number of students studying science in senior secondary school since a credit pass in integrated science (now Basic Science) is compulsory for studying chemistry and other science subject in senior secondary school levels. Obasi (2007) stresses the fact that students' achievement at any level of education depends largely on the availability of certain factors that could influence their effective learning of the subject matter or content of what is to be learnt. Kueken and Marie (2012) posit that students' achievement orientation could be improved through several approaches that involve participatory activities and active engagement with prescribed literacy texts, Ogaboh, Ikoh and Ashibi (2010) reported that class participation positively influences students' success in academics. This concurs with the research findings of Orji (2004) who reports a significant relationship between students' class participation and their learning outcomes in Basic science. John Dewey was an educational philosopher and pragmatist who made major contributions to education. This could be seen in his belief in what education and teaching are. John Dewey believes that children are socially active learners who learn by exploring their environment (Eggen and Kenchak, 2006). Dewey (1933) wrote

> *I believe that all education proceed by the participation of the individual in the social consciousness of the race. I believe that the only true education comes through the simulation of the child's powers by the demands of the social situation in which he finds himself, through these demands he is stimulated to act as a member of a unity, to emerge from his original narrowness of action and feeling and to conceive of himself from the standpoint of the welfare of the group to which he belongs.pp.142*

Schools should take the advantage of this mutual curiosity by bringing the outside world into the classroom making it available and accessible for students. He believes that there should be an integration of theory and practice, the cyclic pattern of experience and the conscious application of that learning experience. Dewey proposed his concept of reflective thinking in his book, How We Think (1933). He substituted the word "inquiring" for "reflective thinking" in his later work, Logic: The Theory of inquiring according to Dewey (1933) is the "active, persistent, and careful consideration of any belief of supposed form of knowledge in the light of the grounds that support it and the further conclusion which it intends." Inquiring in this perspective seems to connote something more active and operational than thinking. It refers to the activity engaged in to overcome a situation of doubt to generate knowledge, with provisional and tenuous results, posited in the light of new experience and insight. To Dewey, reflective activity occurs when a person decides to face a perplexed, troubled or confused situation and prior to a clear-up unified and resolved situations. He listed five phases or aspect of reflective thought which are:

- Suggestion
- Intellectualization of difficult or perplexity that has been felt (direct experience) into a problem to be solved, a question for which the answer must be sought.
- The use of one suggestion after another as leading idea
- Mental elaboration of the idea or suppositions
- Testing the hypothesis by overt or imaginative action to give experimental corroboration or verification of the conceptual idea. (Ross and Hannay, 1986; Dewey, 1933).

Furthermore, Dewey views thinking as a part of a process that culminated in plans, with the objective of altering life conditions to improved ways. It involves a look into the future, a forecast, anticipation or a prediction (Dewey, 1933). He also advocated flexibility in his approach to problem solving:

> *The five phase, terminals, or functions of thought that we have noted do not follow one another in a set order. On the contrary, each step in genuine thinking does something to perfect the formation of a suggestion and promote its change into a leading idea or directive hypothesis. It does something to promote the location and definition of problem. Each improvement in the idea leads to new observation that yield new facts or data and help the mind judge more accurately the relevancy of facts already at hand pp. 206*

Dewey believes that the teacher's place and work in the school is not to impose certain ideas or to form certain habits in the child, but is there as a member of the community to select the influences which shall affect the child and to assist him in properly responding

to these influences. Reflective model highlights the concept of experimental learning and is centered on the transformation of information into knowledge. This takes place after the situation has occurred and entails a practitioner reflecting on the experience, gaining a general understanding of the concepts encountered during the experience and then testing these general understandings on a new situation. In this way the knowledge that is gained from a situation is continuously applied and reapplied building on a practitioner's prior experience and knowledge (Kolb and Kolb, 2005). Reflective practice was introduced by Donald Schon in his book: The reflective practitioner in 1983. However, the concepts underlying reflective practice are much older. It focuses on the ways people think about their experiences and formulate responses as the experiences happen. This approach makes a clear distinction between "thinking on action" and "thinking in action". Thinking on action is the way of analyzing experiences as they happen while thinking in action determines how responses are formulated (Krause, 2004). This whole idea is considered as "thinking on your feet". Following this line of thinking, the reflective students makes decision based on a problem-solving paradigm. Problems are not viewed as obstacles to overcome but as opportunities to be met. Students reflect on problems, and as part of a learning community, they call on others (i.e. their peer and senior colleagues) to reflect on identified problems. In such cases, they collectively list a series of alternatives that they can take. Ultimately, such list is narrowed down to a set of actions that are ethical, just and educationally sound. Reflective teaching can be thought about in terms of asking searching questions about experience and conceptualized as both a state of mind and an on-going type of behavior. Being a reflective practitioner at any stage in teacher development involves constant, critical look at teaching and learning and at the work of the teacher (Harrison, 2009). Think-Pair-Share is also a cooperative instructional strategy designed to provide students with 'food for thought' on a given topic which enable them to formulate individual ideas and share these ideas with another student. It is a teaching strategy developed by Lyman and associates in 1981 to encourage students' classroom participation rather than using a basic recitation method in which a teacher poses question and one student offers a response. It helps students develop conceptual understanding of a topic, develop the ability to filter information and draw conclusions and develop the ability to consider other's point of view (Koya, 2014). Think-Pair-Share can be modified to fit any class size and any situation. Students do not have to move from their current seats and discussion can be guided (Wendy, 2007). The method is designed to promote discussion and help students help each other fill in the gaps or ask questions that they may not ask publicly in class. This active process is not normally available to them during traditional lecture methods. Think-Pair-Share strategy gave students opportunity to learn better from each other as they rub minds together and iron out problems with one another. This must have instilled in them a great deal of concern for the problem attributed to Basic science concepts. This might have brought about a re-think to change their behavior that can predispose them to the epidemic. This supports Slavin& Hundey (2000) and Bandura (1986) submission that the importance of social interaction for direct observations.

Conventional or traditional teaching methods are the old school of teaching which are old fashioned, routine teaching, archaic e.g. drill, lecturing. Orlich, Harder, Callahan,, Travisan and Brown, (2010) indicated that many science teachers prefer the traditional expository lecture method of teaching i.e. a teaching method in which one person, the teacher, presents a spoken discourse on a particular subject and shy away from activity-oriented teaching methods which are student centred (discovery method, reflective method, discussion method, inquiry method among others). Nwagbo (2006) observed that such teacher centred approaches place the teacher as the sole possession of knowledge and the students as passive recipients of knowledge, may not enhance achievement in Basic science. Lecture method is most frequently used in schools. This may be due to its effectiveness for large classes which are common to Nigerian science classes due to shortage of classroom accommodation. The teacher should be seen as a facilitator and not the sole custodian of knowledge and student centred mode of teaching should be used. Students should not be seen as blank slates which need to be filled with information. The teacher provides structural and supportive professional role to the students in analysis, interpretation and reporting of findings (Sampson and Yeoman, 2010) because every educator has moral obligations and ethics to assist all students to realize their full potentials. Students need to be given opportunity to be actively involved in the learning process, Duyilemi, (2005). According to Okebukola (2002) the purpose of learning is for an individual to construct his or her own meaning and not just to memorise the "right answers and regurgitate someone else's meaning. Numerical ability of the students is an important factor in reflective thinking. Adesoji (2002) opined that students are not the same especially when we find out the rate at which facts and principles in science are being assimilated. This implies that the rate at which an individual performed his specific task differs. According to Gunderson, Ramirez, Beilock and Levine (2011), improving children's spartial skills may have positive impact on their future success in Science Technology and Mathematics (STEM) disciplines not only by improving the spartial skills that are necessary in many sciences and engineering fields but also by enhancing the numerical skills which form the backbone of the advanced mathematics critical to all STEM fields.

Statement of the Problem

This study, therefore determines the effects of Think-Pair-Share collaborative inquiry as one of classroom practices for improving students' reflective thinking skills in Basic Science. The study further investigates the moderating effects of numerical ability on the dependent measure.

Hypotheses

The following null hypotheses were tested in the course of this study at 0.5 level of significance.

H_{01}: There is no significant main effect of treatment on students' reflective thinking skills

H_02: There is no significant main effect of numerical ability on students'reflective thinking skills

Methodology

The pretest- posttest, control group, quasi-experimental research design was adopted for this research. Oyo state is stratified into three senatorial districts: Oyo North, Oyo Central and Oyo South. One senatorial district, Oyo North was randomly selected for the study; three Local Government Areas were randomly selected. These are Iseyin, Itesiwaju and Kajola Local Government Areas. Three schools were purposively selected from each LGA. In each school, an intact class was selected out of all the nine representative schools for the study. The treatment was assigned to the three schools in each Local Government Area of the study.

The criteria for the selection will be based on:

i. The school is a public co-educational secondary school.
ii. The JSS 2 students in the school have completed the JSS 1 Basic Science Curriculum at the time of data collection.
iii. The school must have produced candidates for public examinations like JSSCE for not less than 5 years.
iv. Willingness of the required members of staff to participate in the study.

Research Instruments

Six instruments were used in the study. These include are:

1. Students Basic Science Reflecting Thinking Achievement Test (SBSRTAT).
2. Numerical Ability Test (NAT)
3. Instructional Guide on Think-Pair-Share Strategy in Basic Science (IGTPSBS).
4. Instructional Guide on Conventional Strategy in Basic Science (IGACSBS).
5. Evaluation sheets for assessing teacher performance on the strategies(ESATPS) on Think-Pair-Share Strategy
6. ESAT on Modified Conventional Strategy

Students Basic Science Reflecting Thinking Achievement Test (SBSRTAT)

This instrument was used to test the JSS II students' intellectual achievement in the following selected contents viz: Work, Energy and Power, Chemical, Living things and Types of energy. The test contains twenty multiple choice objective test items. It has two sections with Section A containing demographic information while Section B containing the test items constructed as presented in Table 2. The test items generated covered the cognitive domain of knowledge, understanding and thinking in accordance with Okpala and Onocha (1995).

Table 2: Table of Specification for (SBSRTAT)

Topic	Knowledge	Understanding	Thinking	Total
Work, Energy and Power	(1) 18	(3) 8,11,19	(2) 9,16	6
Petrochemicals and Crude oil	(2) 1, 14	(2) 2,12	(1) 20	5
Living things	(1) 6	(1) 3	(2) 10,13	4
Types of Energy	(2) 4,7	(1) 15	(2) 5.17	5
Total	6	7	7	20

Source: Okpala and Onocha (1995)

Validation and Determination of Reliability coefficient of (SBSRTAT)

The data collected were analysed using Kuder-Richardon formula 21 (KR_{21}). The reliability coefficient of 0.80 and an average item difficulty index of 0.49 were obtained.

Numerical Ability Test (PTNAT)

This instrument was administered to the students before exposing them to treatment. The instrument developed by the researcher consists of two sections. The section A seeks for demographic information of the respondents such as name, college, sex and while section B consists of 30 items which the students will solve on the space provided on the question paper to test their numerical ability level.

Validation of NAT

To validate NAT, the instrument was given to two experts in Science Education. Their advice was incorporated into the items. The modified test items was administered to thirty five pre-service teachers that will not be involved in the main study to determine the reliability and internal consistency of the scores using Split-half method. The reliability index obtained was 0.79.

Instruction guide on Think-Pair Share instructional strategy

This is an instructional guide for teacher participating in the experimental group. It contains the statement of topic, objectives and the procedure expected to be followed by teachers in the teaching of the topic under consideration using Think-Pair Share instructional strategy. It used in the training of teachers to allow uniformity in the teaching strategy.

Steps involved in using Think-Pair-Share instructional strategy.

- Introducing the lesson.
- Explanation of the rules of the lesson.
- Students were paired.
- Presentation:
- The teacher posed a question on the topic
- Students were given 'think time'
- Students turned to their partners to share ideas after 'think time'.

- Each pair shared their ideas with the whole class in turns.
- Students' responses were written on the chalkboard for discussion.
- Summary
- Evaluation.

Conventional Strategy Guide

This will contain the roles of the teacher and the students in Modified conventional learning situation. Experts in the field of education will do the face validity while experts in chemistry education will do the chemistry editing of the guide.Here students will sit individually and not in group throughout the lesson.

The treatment for each lesson involved the following steps:

1. The teacher presented the lesson in form of lecture method.
2. Students listened to the teacher and write down chalkboard summary.
3. Students asked the teacher questions on areas of the topic that is not clear to them.
4. The teacher asked the students questions and the students answered individually.

Evaluation Sheet for Assessing Teachers' Performance on the use of the Strategies (ESATP)

This is the guidelines for evaluating performance of the trained teachers on the effective use of these strategies

(1) Think-Pair- Share instructional strategy

(2) Modified Conventional Strategy

This is a rating scale that is made up of two sections

Section A – This consisted of the personal data of the trained teacher containing name, school, period, class taught, date and the summary of the concept discussed in the class.

Section B - This consisted of items to be evaluated. The items were placed on a 5-point likert type rating scale ranging from Very Good (VG), Good (G) Average (AV) Poor (P) and Very Poor (VP).

The scoring of ESAT is as follows:

Very Good (VG)	-	5marks
Good (G),	-	4 marks
Average (AV)	-	3 marks
Poor (P)	–	2 marks
Very Poor (VP)	–	1 mark

Validation of ESAT

The instruments were trial tested to ensure its reliability. For the purpose of validation, expert's attention was drawn to ascertain the appropriateness of the concepts and methods

to the target population. The observations and comments of these experts were taken into consideration while preparing the final draft. The reliability of ESATP of Think-Pair-Share instructional strategy was 0.82 while the reliability of ESATP of Conventional instructional strategy was 0.83.

Procedure for data collection

The data collection will last for twelve weeks. The phases were:

- Visitation to the schools for one week
- Training of teachers(research assistant) for two weeks
- One week for pre- test
- Six weeks for treatment using the research assistant and Teacher's Instructional Guides on the listed strategies. This takes place simultaneously in all the school selected.
- One week for post – test for SBSRTAT
- A total number of twelve weeks will be used for the study.
  (Prior to the collection of data, the participating teachers will be trained. The training program will last for two weeks. The training of the teachers will focus on the use of Think-Pair-Share instructional and conventional strategy).

Training of Teachers

The researcher trained the research assistants (Teachers) for two weeks.

Pre-Test

The instrument will be administered in the following order; The Student's Basic Science Reflective Thinking Achievement Test (SBSRTAT) and finally Numerical Ability Test.

Treatment

Experimental group

Experimental group 1: Treatment in this group involved Think-Pair-Share instructional Strategy the following steps.

- Introducing the lesson.
- Explanation of the rules of the lesson.
- Students were paired.
- Presentation:
- The teacher posed a question on the topic
- Students were given 'think time'
- Students turned to their partners to share ideas after 'think time'.
- Each pair shared their ideas with the whole class in turns.
- Students' responses were written on the chalkboard for discussion.
- Summary
- Evaluation.

Control group

Here students will sit individually and not in group throughout the lesson.
The treatment for each lesson involved the following steps:

1. The teacher presented the lesson in form of lecture method.
2. Students listened to the teacher and write down chalkboard summary.
3. Students were to ask the teacher questions on areas of the topic that is not clear to them.
4. The teacher asked the students questions and the students answered individually.

Post Test

After six weeks of treatment, post-test was administered on the experimental and the control groups. The Student's Basic Science Reflective Thinking Achievement Test (SBSRTAT) was re-administered.

Procedure for Data Analysis

The data was analyzed using inferential statistics of Analysis of Covariance (ANCOVA) of the posttest scores with the pretest scores as covariates. Multiple Classifications Analysis was used to determine means of different groups.

Results

H_{01}: There is no significant main effect of treatment on students' reflective thinking achievement in Basic Science

Table 3: Summary of Ancova of Post Test Achievement by Treatment, Numerical Ability and Mode of Entry

Source of varicose		Sum of square	df	Mean square	F	Sig
Covariates	PRE-ACHVT	3939.219	1	3939.219	262.297	.000
Main effects	(combined)	1751.708	5	350.342	23.328	.000
	TREATMENT	1686.517	1	1686.517	56.149	.000
	MODE	1.735	1	1.735	.115	.123
	NUMUMERICAL ABILIT	63.456	2	31.728	2.113	.734
Model		5777.579	18	320.977	1.260	.285
Residual		4145.011	276	15.018	.193	.942
Total		9922.590	294	33.750	21.373	.000

* Significant at p<.05

Table 3 shows that there is significant effect of treatment on students reflective thinking achievement in Basic science ($F_{(2, 276)}$= 56.149; p<.05). This means that there is significant difference in the posttest Reflective thinking achievement scores of those in the Think-

Pair-Share and those in the control group. The null hypothesis la is, therefore, rejected. Table 4 presents the respective performance of the treatment and control groups.

Table 4: Multiple Classifications Analysis of reflective thinking Achievement Mean Scores by Treatment and Numerical Ability

Variable + category		N	Predicted Mean		Deviation		Eta	Beta
			Unadjusted	Adjusted for factors and covariates	Unadjusted	Adjusted for factors and covariates		
TREATMT	TSP CONTROL	121 174	23.09 17.8	21.02 18.89	1.13 -4.09	-94 -3.07	.375 .251	.406 .086
NUMABILI	Low Med High	96 98 101	20.22 21.81 23.77	21.31 22.02 22.53	-1.74 -16 1.81	-.65 5.43 .57		
R= .757								
R squared= .574								

From table 4 students in the Think-Pair-Share higher adjusted reflective thinking achievement mean score ($\bar{x}$ =24.8; Dev. =2.88) than those in the control group ($\bar{x}$ =18.89l Dev.= -3.07). The treatment has therefore impacted more on the experimental groups than the control in terms of achievement in Basic Science.

Ho_2: There is no significant main effect of numerical ability on students 'reflective thinking achievement in Basic Science.

From Table 3, there is no significant effect of numerical ability on the reflective thinking achievement of the students ($F_{(2, 276)}$ =2.113; p>.05). The null hypothesis 2 is therefore not rejected. Table 4 also shows that the high numerical ability group had higher adjusted posttest mean reflective thinking achievement score ($\bar{x}$=22.53; Dev. =.57) than the medium ability ($\bar{x}$=22.02, Dev. =5.43E-02) and the low numerical ability group ($\bar{x}$=21.31; Dev. = -65) respectively.

Discussion, Conclusion and Recommendations

Discussion

The major finding of this study is that there is a significant difference in the reflective thinking achievement of students exposed to Think-Pair-Share and the Modified Conventional Teaching strategies.. The Think-Pair-Share was the more effective strategy followed by Conventional strategy. The superiority of Think-Pair-Share may be due to

the fact that it had a structured format where students were taught, monitored, and evaluated one another. That is, students were part of the educational process and were able to prepare instructional materials, plan the lesson, deliver the lesson receive feedback from peers and reflect after the lesson to identify where problems arose with probable solutions provided against other classes. They functioned both as tutor and as tutee while the teacher acted as a facilitator (Clarke,2007). Also the students monitored their academic progress in a group context, setting team goal and managing their own group reward (Oczkus (2003). These assist the students to improve their perceptions of their own academic competence and self-control. It also made the students to be responsible for the actions in the class, monitoring their academic progress rather than being passive learners. The students were at the center of the teaching and learning process. The bulk of the responsibility lied on them with the classroom teacher only monitoring and providing help when the "teacher" had trouble answering students' questions. The students played the major and important roles in the classroom setting. These roles developed their self-confidence and made them to possess sense of self-direction and self-control in teaching. It also empowered them to take responsibility for their own action and that of their group. Students better performance in Think-Pair-Share may also be due to the fact that they worked cooperatively with their peers thereby providing the social context for the students to actively learn and make deeper connections among facts, concepts and ideas. (Mayfield and Vollmer,2007).This developed their social and communication skills, increased cooperation and tolerance of one another as students were from diverse background working together to achieve group goal and aspiration. This made learning to be more permanent The improvement in reflective thinking achievement with the use of Think-Pair-Share over the other strategy may also be due to the fact that it utilized group reward system and interdependence that maximized learning and motivation (Lavariee,2000),. The students were active learners in the classroom. They took active part in the planning and delivering of a lesson thereby acquitting them with the role of a teacher. This finding is in agreement with the earlier research results obtained by Fuchs and Fuchs (2003).This result is also in agreement with the findings obtained by Hashey & Connors (2003) and Peter, David, Cheri, William and Carl (2006) that found Reflective thinking skills of students as effective in the teaching of science.

Conclusion

The study has established that the Think-Pair-Share Strategy is effective at improving students reflective thinking achievement skills in Basic Science at the Junior secondary school level. This is due to the fact that the strategy allowed the students to meet their classroom needs, made teaching and learning to be more flexible allowing room for change and growth, allow social interaction among the lecturer and pre-service teachers and within the students, encouraged self-regulation, provided both teacher and students feedback and empowered students in self-confidence in terms of their abilities and efforts.

Recommendations

Based on the results obtained and discussed in this study, the following recommendations are hereby made:

- The use of Think-Pair-Share Strategy is recommended to teachers for the teaching of Basic Science in the colleges for better reflective thinking achievement.
- The use of Think-Pair-Share Strategy is recommended in practical class for better acquisition of reflective thinking skills in Basic Science.
- The teachers and students should be encouraged to be a reflective as this would be a form of professional development.
- Government should organize a form of in-service and re-training programme for teachers in the effective use of the Think-Pair-Share Strategy through organization of seminars, workshop, and conferences for science teachers.

Suggestions for Further Studies

Future research should focus on the use of Think-Pair-Share Strategy on the students attitude in Nigeria. The study should also be replicated in other regions of the Federal Republic of Nigeria and in other science subject areas such as Chemistry, Biology and Agricultural Science. Other moderator variables such as students' cognitive style, self-efficacy and attitude should also be investigated.

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