IMPACT OF PORTFOLIO-BASED LEARNING STRATEGY IN BASIC SCIENCE AND TECHNOLOGY ACADAMIC ACHIEVEMENT IN JUNIOR SECONDARY SCHOOLS, MINNA, NIGER STATE

BY

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Abstract

Impact of portfolio-based learning strategy in Basic Science and Technology acadamic achievement in junior secondary schools, minna, niger state. *Two research questions were posed and two null hypotheses tested at 0.05 level of significance. The design of the study was quasi-experimental design. The population comprised of 1065 Senior Secondary school two (JS II) students offering Basic Science and Technology in thirteen public senior secondary schools in Minna of Niger State, Abuja. A sample of 356 JS II students from six intact classes in GAC served as the subjects for the study. One school of two intact classes (mixed) each were selected through purposive sampling technique and assigned to the two experimental groups and control group. Instruments used for data collection was Basic Science and Technology Achievement Test (CAT). The CAT was both face and content validated. The reliability coefficient of CAT was established using Pearson product correlation coefficient formular which yielded an index of 0.79. Data were analyzed using mean and analysis of covariance (ANCOVA). Results revealed that Portfolio-based learning Strategypings ($\overline{X}$ = 9.42) improved students' achievement in Basic Science and Technology but Portfolio-based learning Strategyping instructional strategy improve student academic achievement better than Conventional instructional strategy. The hypotheses related to these findings revealed a significant difference The female (13.26) students performed better than male (13.06) students in CAT using Portfolio-based learning Strategyping. However, these performances were not significant. Consequently, it was recommended that Portfolio-based learning Strategypings instructional strategies be adopted for effective teaching of Basic Science and Technology in secondary schools to enhance the achievement of male and female students and teachers should be trained on how to use this instructional strategy in teaching Basic Science and Technology and other science subjects for effective assimilation by students and consequently, better achievement.*

Keywords: *Portfolio-based learning Strategy, Basic Science and Technology, Achievement*

Introduction

The term technology is derived from two Greek word "techno" meaning, art, skill, craft and "logia" meaning study of. (Popper, 2007). In the same vein, Bain, (2008) an American sociologists asserted that technology includes all tools, machines, utensils, weapons, instruments, housing, clothing, communicating and transporting devices and the skills by which we produce and use them. Stanley (2006) continued by saying technology refer to all tools and procedures used or required for manufacturing and producing materials needed for daily life. Basic Science and Technology therefore, is a subject taught in the junior secondary school with the incorporation of many skilled subjects such as woodwork, metal work, electrical/electronics, mechanics, technical drawing and local crafts to enable students of that school age be abreast with basic technological skills and competencies for useful living in the society (Otamba, 2013). The objectives of Basic Science and Technology are:

i. To provide pre-vocational orientation for further training in technology.
ii. To provide basic technological literacy for everyday living.
iii. To stimulate creativity and innovation.

One of the basic need for teaching vocational subjects in junior secondary school is to enable the individual acquire appropriate skills, abilities and competence as equipment for him to live in, and contribute to the development of his society (Olaitan, 1996). Implicitly, one of the broad aims of secondary education, among others is "to equip the students to live effectively in our modern age of science and technology" (FRN 2004). Despite the relevance of Basic Science and Technology, the cry for poor implementation of the curriculum for Basic Science and Technology still poses a challenge to secondary education in Niger State. Odu (2013) lamented that "unfortunately, a recurring problem besieging basic (technical) education since its inception has been the absence of adequate facilities to foster effective teaching and learning. This lament by Odu prompted Ibe (1992) to suggest the adoption of improvisation of instructional materials by teachers of Basic Science and Technology. He said, improvisation of instructional materials is the preparation and the provision of alternatives to real materials as teaching aids. The inadequacy of instructional materials for teaching is therefore responsible for the idea of adoption of improvisation by teachers to be able to cover areas of need in classroom situation.

In the light of the above expositions, it is very vital to determine the status of Basic Science and Technology as one of the pre – vocational subjects, aimed at enabling the students to live effectively in our modern age of science and technology. The purpose of this study therefore is to ascertain the current status of Basic Science and Technology in Niger State Junior Secondary Schools.

Basic Science and Technology is a central science that cuts across all the sciences and its importance cannot be over emphasized. Basic Science and Technology is fundamental in the world of industrialization. Today, the world is seen as a global village; meanwhile, this perception of globalization is not unconnected with industrialization in which Basic Science and Technology is central. Basic Science and Technology has multiple benefits for national development. It plays fundamental roles in food production, clothing, housing, medicine, transportation, etc. The work anchored on the identification of methodologies which may adduce the modus operandi of teaching this central or core science called Basic Science and Technology. Be that as it may, the subject Basic Science and Technology must be taught at the secondary school level by experts (Basic Science and Technology educationists) who are thoroughly grounded in Basic Science and Technology education (Zudonu, 2011). This is because they are specialists abreast and equip with Basic Science and Technology pedagogy, which is how to go about teaching their learners (Zudonu, 2011). However, in our secondary school system today, the numbers of students who are offering Basic Science and Technology are very few and even the very few ones are performing poorly.

The decline and poor performance may not be unconnected with the teaching methods employed by teachers, as most of them are not teachers but only accept teaching at the last resort (Ajene, (2003); Terngu, 2010 and Osefugbo, 1998). Okegbile (2007) described an academic achievement as a general pedagogical terminology used while determining learners' success in formal education which is measured through reports, examinations, researches and rating with numerous extraneous factors or variables exerting influences. Achievement results revealed the

level of learners' performance and prove their capacities. However, the underachievement is characterized by the results of schools whose educational attainment falls below appreciable level. The poor achievement in Basic Science and Technology may be connected to the incessant use of lecture or traditional method by teachers in secondary school. It could also be as a result of learners' performance that is below their capacities, which is in consonance with the view of Vamadevappa (2002) and Odili (2004) that underachievement comes from a student's scholastic performance that is below his or her ability level.

The main teaching approaches employed by most teachers in implementing the Basic Science and Technology curriculum in Secondary Schools are conventional (teacher-centered) teaching methods such as lecture and demonstration methods. These teaching approaches involve teacher dominated activities with minimal involvement of the learner in the learning process. Literature such as Raymond (2013), Owodunni (2015), and Atsumbe. *et al.*, (2018) has indicated that the continuous use of conventional methods in the teaching of Basic Science and Technology in Secondary Schools in the 21st century is partly responsible for the observed decline of students' academic achievement in examinations in the subject. However, Akamca et al., (2009) reported that teaching learning approaches that are based on Constructivism promotes active learning, and increase in students' achievement in science subjects.

Constructivism has been defined in reference to four principles: learning depends on what we already know; new ideas occur as we adapt and change our old ideas; learning involves inventing ideas, rather than mechanically accumulating facts; meaningful learning occurs through rethinking old ideas and coming to new conclusions about new ideas that are in conflict with our old ideas (Birişçi et al., 2010). The constructivist approach is a paradigm shift towards learner-centered or learner-focused instruction. In a constructivist learning environment, teachers play the role of a guide and helps students to connect their prior knowledge with new information, also students play an active role by actively involving themselves in the learning process and constructing their knowledge by taking part in activities (Kroasbergen&VanLuit, 2005, Gray, 2007). Some of the instructional approaches that are based on constructivism include the use of Portfolio-based learning Strategys.

Portfolios are collection of student work representing a selection of performance. Portfolios in classrooms today are derives from the visual performing arts tradition in which they serve to showcase artists' accomplishments and personally favoured works. A portfolio may be a folder containing a student's evaluation of the strengths and weakness of the pieces.

According to Kingore, 1993, portfolio as "systematic collections of students work selected to provide information about students attitudes and motivation, level of development and growth over time."

Recent changes in education policy, which emphasize greater teacher involvement in designing curriculum and assessing student, have been an impetus to increased portfolio use. Portfolios are valued as an assessment tool because, as representations of class-room based performance, they can be fully integrated in to the curriculum.

Moreover, many teachers' educators and researchers believe that portfolio assessments are more effective than 'oldstyle' tests for measuring academic skills and informing instructional decisions Academic achievement is the accomplishment or acquired proficiency in the performance of an individual in a given skill or body of knowledge. According to Rastogi (2012) academic achievement means knowledge attained and skill developed in the school subjects usually designated by test score or by marks assigned by teachers or by both. This implies that academic achievement can be measured with the help of verbal or written tests of different kinds. Therefore, in this study academic achievement refers to achievement attained by a student as represented by marks or scores obtained in Basic Science and Technology achievement test.

One of the factors that influence the academic achievement of a learner is gender. Gender refers to the socially constructed roles, behaviours, activities and attributes that a given society considers appropriate for men and women. Myers (2002), however, explained that gender refers to the characteristics, whether biological or socially influenced, by which people define male and female. The term gender, therefore, in this work is used to classify male and female students. In education, a number of differences have been established and documented between the achievement of male and female students. The gender gap in education is also visible in vocational courses which prepare students for a career, as statistics have shown that a large proportion of girls achieve distinctions, even in subjects such as engineering and construction where they are a minority (Mahmood, 2011). However, available literatures on gender issues are sometimes conflicting. While some advocate male superiority, others take opposite view. For example, Owodunni (2013) in a study found that male students performed better than their female counterparts in Radio, Television and Electronic Work while the study conducted by Oviawe (2010) revealed that gender of the students had no significant effect on their performance in Building Technology. The form of male and female students' achievement in Basic Science and Technology will also be of interest to Basic Science and Technology teachers particularly in relation to classroom instructional approaches.

Statement of the Research Problem

It has been observed that students often have specific difficulties understanding Basic Science and Technology concepts and at times hold misconception about some of these concepts. Several research reports over the years have indicated a worrisome decline of students' academic achievement in Basic Science and Technology (Taale& Mustapha, 2014). Animasahun (2013) lamented that despite the huge resources expended by Nigerian stakeholders in the educational sector, mass failure in public examinations, especially in science and technology-related areas which includes Basic Science and Technology, is still being recorded every year. A critical analysis of WAEC results in Basic Science and Technology in the North-Central States of Nigeria between the years of 2015-2019 indicated a failure rate of 52%, 61%, 54%, 60% and 51% respectively (NABTEB, 2015, 2016, 2017, 2018 & 2019). The unsatisfactory academic achievement in Basic Science and Technology has been partly blamed on inadequate teaching methods adopted by Basic Science and Technology teachers (Raymond, (2013), Owodunni, 2015, Atsumbe et al., 2018). This therefore, calls for immediate attention in order to arrest the situation.

Apparently, the main teaching approaches employed by teachers in implementing Basic Science and Technology curriculum seem inadequate in improving students learning outcomes in Basic Science and Technology (Taale& Mustapha, 2014). The conventional teaching methods: lecture and demonstration methods are executed by the activities of the teacher with minimal students' involvement in the learning activities. Hence, the teaching approaches do not seem to possess the tools that will help teachers assist the students become more involved in the learning process, overcome difficulties in understanding concepts, identify and eliminate misconceptions as well as improve academic achievement in Basic Science and Technology.

It is therefore very necessary to adopt instructional approaches such as Portfolio-based learning Strategy with the potentials in overcoming the weaknesses of the present teaching methods employed in teaching Basic Science and Technology. This is because when students develop misconceptions in primary concepts of Basic Science and Technology they will find it very difficult extending their understanding to advanced topics. Usually, when learners find these courses difficult for understanding, it brings down their interest, motivation in studying and success of learning. Also, these difficulties may even dissuade students from pursuing further study in electrical/electronic related courses. Consequently, lack of good Basic Science and Technology knowledge and skills are very likely to have a detrimental effect on preparing students to work in the 21st century electrical/electronic world of work where they are expected to contribute meaningfully to Nigeria's developing economy.

Furthermore, literature (Akamca et al., 2009; Aydin, 2015; Sıksoy, 2019; Chien-hsun, 2006) has indicated that constructivist based instructional approaches such as Portfolio-based learning Strategy hold significant promise in helping teachers identify and eliminate students' misconception as well as improve interest and academic achievement of learners. Even though, Portfolio-based learning Strategy and computer aided conventional are purported to have the potential in indentifying and eliminating misconceptions and achieving better learning outcomes, it is not yet known whether Portfolio-based learning Strategy or conventional may be more effective in indentifying and eliminating misconceptions and achieving better learning outcome as well as facilitating and sustaining students' interest in Basic Science and Technology. Therefore, the problem of this study posed as a question is: How would the use of Portfolio-based learning Strategy affect students' academic achievement in Basic Science and Technology.

Purpose of the Study

The general aim and objectives of the study is to determine the effects of Portfolio-based learning Strategy on students' achievement in Basic Science and Technology. Specifically, the study is designed to determine the effect of:

1. Portfolio-based learning Strategy on students' achievement in Basic Science and Technology.
2. Gender on the achievement of students taught Basic Science and Technology with Portfolio-based learning Strategy and conventional instructional approach.

Research Questions

The following research questions are formulated to guide the study:

1. What is the effect of Portfolio-based learning Strategy on students' achievement in Basic Science and Technology?
2. What is the effect of gender on the achievement of students taught Basic Science and Technology with Portfolio-based learning Strategy and conventional instructional approach?

Hypotheses

The following null hypotheses are formulated and will be tested at 0.05 level of significance:

HO1: There is no significant difference in the achievement of students taught Basic Science and Technology with Portfolio-based learning Strategy and those taught with conventional instructional approaches.

HO_2: Gender has no significant effect on the achievement of students taught Basic Science and Technology with Portfolio-based learning Strategy and those taught with conventional instructional approaches.

HO_3: There is no significant interaction effect of treatment given to students and their gender with respect to their achievement in Basic Science and Technology.

Methodology

The study will be conducted using the quasi- experimental design, specifically the pre-test and post-test; non equivalent control group design was used. This implies that, intact classes (non-randomized groups) were used for the study. According to Sambo (2005) quasi experimental research design permits the use of intact classes. The study targeted 642 Senior Secondary school two (JS II) students offering Basic Science and Technology in eight public senior secondary schools in Minna of Niger State, Abuja. Purposive sampling technique was used to select two schools while simple random technique was used to assigned one school each to experimental group one and two. Purposive was used to ensure that all the schools selected are mixed schools. The selected schools are Government secondary School Minna with 73 (45 male and 28 female) students as experimental group I and Government Secondary School Minna with 64 (37 male and 29 female) students as Experimental group II.

The instrument for the study was Basic Science and Technology Achievement Test (CAT). The CAT was used to measure students' achievement in Basic Science and Technology. It consists of 25 multiple-choice items with four options. The test items were selected from the Basic Science and Technology curriculum. In constructing CAT, the researcher prepared a table of specification (test blue print) to guide the test development, in accordance with JS II curriculum which contains the cognitive learning outcome of the items of the test. The researcher prepared two (2) sets of lesson plan for teaching the experimental and control groups. These were prepared using the test blue print. Each unit contained five lesson plans that lasted for five weeks. The researcher ensured that Basic Science and Technology teachers that were teaching in the selected classes and schools are trained for this study.

The instrument Portfolio-based learning Strategyping and Conventional Lesson Plans; and Basic Science and Technology Achievement Test items were content and face validated by five Experts. The validation of these instruments CAT was carried out by three professionals in

measurement and evaluation and two professionals in Basic Science and Technology education all from University of Abuja. The CAT was subjected to a trial testing to ascertain the reliability of the instrument. The researcher administered the instrument to 40 SJS II Basic Science and Technology students of Government Secondary school Kuje in FCT which is not part of study school. The CAT was scored out of 25 (2 mark each). The scores obtained from the trial testing was used to determine the internal consistency and reliability coefficient of the instrument. The internal consistency of CAT was determined using Kunder Richardson formula 20 (K-R 20) and test of stability using Test Retest. (K-R 20) was used in establishing reliability since the test items (CAT) are of multiple-choice types. Also test retest was used to further determine the reliability of CAT test items. The test was administered again after a week interval and the scores will be used to determine the reliability (stability) of CAT. The internal consistency reliability coefficient of CAT was 0.69.

Four regular Basic Science and Technology teachers selected for the study will be trained by the researcher to assist in the study. The conduct of the study will take place during the normal school lesson periods, following the normal timetable of the school been used for the study. The regular school Basic Science and Technology teachers will be used. On the first day before the lesson commence, the CAT was administered as pretest for both experimental and control groups, after which proper teaching commenced by the use of prepared lesson plans for each group. The researcher supervised the teachers during the teaching process to ensure that teacher do not deviate from the prepared lesson procedure. At the end of six weeks of ten (10) periods, the teachers administered the post-CAT. The assessment was used to evaluate the effectiveness of the instructional strategies. The scripts were marked and scored with the used of the marking scheme. The scoring of CAT was based on 50 marks. The exercise provided post treatment data for each of the dependent variable (Achievement) after the treatment. Students 'answer sheet was attached with the question papers in pre-test and posttest while at post-post test students submitted their answer booklet, only. During the exercise, the researcher made attempt to control the following variables.

(a) Teacher Variable, (b) Pre-test sensitization, (c) Initial Group Differences, (d) Subjects Interaction and (e) Hawthorne Effect

Data obtained from the pre- test and a post- test score were analyzed using descriptive statistics in the form of frequency and percentage with the aid of Statistical Package for Social Sciences (SPSS) version 20 computer software.. Mean was used to answer the research questions and Analysis of covariance (ANCOVA) was used to test the research hypotheses at $P < .05$.

Results

In this chapter, results of the study are presented in accordance with the research questions and hypotheses.

Research question 1: What is the effect of Portfolio-based learning Strategy and conventional instructional approach on students' achievement in Basic Science and Technology? Analysis of the research findings was as is illustrated in Table 1

Table 1: Mean Achievement Scores of Students who were taught with Portfolio-based learning Strategyping and Conventional instructional strategies

Group	N	Pretest	Post-test	Mean gain
Experimental Group	83	9.59	43.12	33.53
Conventional	74	9.65	40.81	31.16

Table 1 show the mean achievement score of students who were taught with Portfolio-based learning Strategyping and Conventional instructional strategies. Students who were taught with Portfolio-based learning Strategyping had a mean of 9.59 in the pretest, 43.12 in posttest and mean gain of 33.53 while students who were taught with Conventional had a mean of 9.65 in the pretest, 40.81 in the post test and a mean gain of 31.16. The mean achievement scores of students taught with Portfolio-based learning Strategyping is higher than the mean achievement score of students taught with conventional. The pretest mean achievement scores of the two groups 9.58 and 9.65. This indicates that the students were at the same level before the experiment.

4.1.2 Research Question 2: What is the effect of gender on the achievement of students taught Basic Science and Technology with Portfolio-based learning Strategy and conventional instructional approach? Analysis of the research findings was as is illustrated in Table 2

Table 2: *Mean of Pretest and Posttest of Male and Female Students Taught Basic Science and Technology in the Achievement Test*

Gender	Portfolio-based learning Strategyping				Conventional			
	N	Pretest	Posttest	*Mean Gain* $\overline{X}$	N	Pretest	Posttest	*Mean Gain* $\overline{X}$
Male	51	9.55	42.92	33.37	57	9.61	41.25	31.64
Female	31	9.63	41.13	31.50	36	9.57	38.83	29.26

The data presented in Table 2 show that male students taught Basic Science and Technology with Portfolio-based learning Strategyping had a mean score of 9.55 in the pretest and a mean score of 42.92 in the posttest making a pretest, posttest mean gain in the male students taught with Portfolio-based learning Strategyping to be 33.37. Meanwhile, female students taught Basic Science and Technology with Portfolio-based learning Strategyping had a mean score of 9.63 in the pretest and a posttest mean of 41.13 with a pretest, posttest mean gain of 31.50. Also, male students taught with Conventional had a mean score of 9.61 in the pretest and a mean score of 41.25 in the posttest making a pretest, posttest mean gain in the male students taught with conventional method to be 31.64. Meanwhile, female students taught Basic Science and Technology with Conventional had a mean score of 9.57 in the pretest and a posttest mean of 38.83 with a pretest, posttest mean gain of 29.26. With these results male students taught Basic Science and Technology had higher mean gain scores than female students in the Achievement Test. Thus, there is an effect attributable to gender on the achievement of students taught Basic Science and Technology.

Hypothesis 1

HO_1: there is no significant difference between the mean achievement scores of students who were taught with Portfolio-based learning Strategyping and those who were taught with conventional strategies.

Table 3: *Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of the two Experimental groups in the Achievement Test,*

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	998.136[a]	4	502.113	46.231	.000
Intercept	1674.136	1	1674.136	358.330	.000
Pretest	11.251	1	11.251	.643	.381
Group	754.420	1	754.420	167.123*	.007
Gender	55.173	1	55.173	3.561*	.031
Group * Gender	5.115	1	5.115	.925	.138
Error	386.422	152	6.106		
Total	46781.000	157			
Corrected Total	1356.448	156			

***Significant at sig of F< .05**

The data presented in Table 3 shows F-calculated values for mean scores of experimental and control groups in the achievement test, gender and interaction effect of treatments and gender on students' achievement in Basic Science and Technology. The F-calculated value for Group is 167.123 with a significance of F at :007 which is less than .05. The null-hypothesis is therefore rejected at .05 level of significance. With this result, there is a significant difference between the mean achievement scores of students taught Basic Science and Technology with Portfolio-based learning Strategyping and those taught with conventional.

4.2.2 Hypothesis 2

HO_2: There is no significant mean difference between the effect of gender (male and female) on students' achievement in Basic Science and Technology.

Table 4: *Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of male and female students in the Achievement Test,*

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	998.136[a]	4	502.113	46.231	.000
Intercept	1674.136	1	1674.136	358.330	.000
Pretest	11.251	1	11.251	.643	.381
Group	754.420	1	754.420	167.123*	.007
Gender	55.173	1	55.173	3.561*	.031
Group * Gender	5.115	1	5.115	.925	.138
Error	386.422	152	6.106		
Total	46781.000	157			
Corrected Total	1356.448	156			

***Significant at sig of F< .05**

The data presented in Table 4 shows the F-calculated value for gender is 3.561with a significance of F at .031 which is less than .05. This means that there is significant difference between the effects of Gender on students' achievement in Basic Science and Technology. Therefore, the null hypothesis of no significant difference between the effect of gender (male and female) on students' achievement in Basic Science and Technology is rejected at .05 level of significance.

Discussion of Findings.

The results in table1 show that students in experimental group I had a higher mean achievement score in Basic Science and Technology than students in Experimental group II. This is further affirmed by the result in table 2 at the F-calculated value (167.123) with a significance of F (.007) and confidence level .05 which indicated that Portfolio-based learning Strategyping is a significant factor in the mean achievement scores of students in Basic Science and Technology. This means that students who were taught with Portfolio-based learning Strategyping achieved better than those who were taught Conventional. This is in concurrence with Kabapınar (2005) who carried out a study on the effectiveness of teaching via Portfolio-based learning Strategyping and discovered that Portfolio-based learning Strategyping enhanced higher students' achievement Thus this result affirms the use of Portfolio-based learning Strategyping as means for meaningful learning/teaching of Basic Science and Technology. This result is also in support of Yilmaz (2020) and Abdullah and Mesut (2015) who indicated that it is good to use Portfolio-based learning Strategyping in teaching science lessons. Birisci et al., (2010) has shown that using Portfolio-based learning Strategyping as an instructional approach improves students' academic success, retention ability and attitudes toward science in positive ways. Wushishi*et al* (2013) contended that those who were taught using Portfolio-based learning Strategyping performed better those that were exposed to conventional method of teaching. Concepts enable learners to focus on the physical meaning of the abstract concepts, subsequently, to get a detailed understanding of the theory (Azar&Şengüleç, 2011; Bayrak, 2008).

The data presented in Table 3 provided answer to research question 2. Finding revealed that male students had a higher mean score in the Basic Science and Technology achievement test

than female students. At the same time, Analysis of covariance was employed to test the second hypothesis, Table 4, at the calculated F- value (.925), significance of F (.138) and confidence level of .05, there was a significant difference between the main effects of gender (male and female) on students' achievement in Basic Science and Technology which confirmed that the difference between the achievement of male and female students in Basic Science and Technology was statistically significant favouring boys. The obvious implication of this finding is that there was an effect attributable to gender on achievement of students in Basic Science and Technology. The research findings which show that Portfolio-based learning Strategyping and conventionals as strategies for teaching and learning of Basic Science and Technology promotes more the achievement of boys than girls, concurred with findings of Njoku, (1997) and Ukwungwu, (2001) who discovered in their studies that male show superiority in achievement than their female counterparts in Basic Science and Technology and physics. These findings also concur with that of Sadker, (1994) who observed that sitting in the same classroom and listening to the same teacher is received differently by boys and girls.

Conclusion

The need to find the best method to assist secondary school students in Basic Science and Technology is essential for achievement in sciences and other related profession as a whole. From the foregoing discussion it can be concluded that mappings are better method of teaching Basic Science and Technology. However, Portfolio-based learning Strategyping instructional strategy is a better strategy for teaching and learning of Basic Science and Technology as compared to Conventional instructional strategy. Furthermore, the study showed that boys performed better than girls in Basic Science and Technology when exposed to Portfolio-based learning Strategyping and conventional strategies. In general, the use of Portfolio-based learning Strategyping and conventional instructional strategies has proved to be viable tool in enhancing meaningful teaching and learning in Basic Science and Technology.

Recommendations

The accompanying suggestions were made based on the findings of this study

1. Workshops / Seminars should be organized by the Government for Basic Science and Technology teachers to enable teachers learn how to use Portfolio-based learning Strategyping in teaching Basic Science and Technology.
2. Secondary School teachers should adopt the use of the Portfolio-based learning Strategyping instructional technique to the teaching of Basic Science and Technology.
3. Nigeria Educational Research and Development Council (NERDC) should consider review of curriculum for Basic Science and Technology with a view to incorporating Portfolio-based learning Strategyping instructional Strategies into the teaching of Basic Science and Technology
4. Government should provide materials and equipment needed to teach the state- of- the- art of Basic Science and Technology in the Secondary Schools.

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