

5Es Constructivist Instructional Strategy and Academic Performance of Pupils in Basic Science and Technology in Akwa Ibom South Senatorial District

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Abstract

This study investigated the effect of 5Es constructivist instructional strategy on academic performance of pupils in Basic Science and Technology in Akwa Ibom South Senatorial District. Six research questions and six null hypotheses were postulated to guide the study. Three major theories were used for the study. Quasi-experimental research design, specifically, it is a pretest – post-test non-equivalent control group design was used for this study. The population of the study was 10,520 primary school pupils in 282 public primary schools in Akwa Ibom South Senatorial District. A sample size of 240 primary three pupils from eight intact classes was used in the study. This made up of 116 males and 124 females. The instrument for data collection was Basic Science and Technology Performance Test (BSTPT). Mean and standard deviation were used in answering the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The result revealed that, there is a significant difference in pupils' ability to describe, classify and retain scientific concepts than those taught using conventional method. It was also found that there was no significant difference between male and female with respect to performance and retention when taught with 5Es constructivist instructional strategy and those taught using conventional method. It was concluded that a better understanding and retention of scientific concepts in Basic Science and Technology was provided by 5Es constructivist instructional strategy. Based on this, the study recommended among others that since 5Es constructivist instructional strategy encourage better retention of learnt concepts of primary school pupils. It should therefore be used regularly in the teaching and learning situation. In service training for teachers in form of seminars, workshops - conferences should focus more on how to use 5Es constructivist instructional strategy for the teaching of scientific concepts. The government or relevant professional bodies like Science Teachers' Association of Nigeria (STAN) could do this.

Keywords: 5Es, Constructivist, Instructional Strategy, Academic Performance, Science, Technology, Scientific method.

Introduction

The word science is a derivative of the Latin word "scientia" meaning knowledge. Knowledge generally implies all the truths, facts, information and principles learned throughout time (Ezeh, 2013). However, this does not suggest that all the learned information, facts, truth and principles are science. Science is a special type of discipline with peculiar characteristics; the prominent among them is the approach through which knowledge is pursued. This approach is commonly known as scientific method. Scientific method is a logical, rational and systematic process by which knowledge in the discipline is

pursued and conclusion about nature around them derived. Science plays an important role in the society because it relates to our daily life and to every career. Our daily life activities and career are the products of scientific knowledge, and thinking. Science helps to construct further knowledge and understand phenomena, which are the consequences of the tremendous development of technology (Ezeh, 2013). Based on the numerous importance of science, Nigerian government through the Federal Ministry of Education recommended the teaching of science subjects in primary school of which Basic Science and Technology is one of them.

Basic Science and Technology literacy is understood to mean basic scientific and technological knowledge and skills needed to understand our physical world, environmental problems and the role and function of technology in a society increasingly marked by global inter connected networks. This calls for the introduction of Basic Science and Technology in our schools. Basic Science and Technology for primary schools (UBE Edition) is a new six years course written to cover the core curriculum for primary science produced by the Nigerian Education Research Development Council with many attractive and true-to-life illustrations drawn from the pupils immediate environment (Igwe, 2013). The course makes the teaching and learning of science fun and effective. It also adequately exposes pupils to basic scientific processes and skills. Modern society is characterized, among other things by the numerous scientific and technological issues and invention that plays an increasingly important role in everyday life. The basic understanding of science has therefore become indispensable and must therefore, be done to strengthen basic education in science and technology literacy (Achor, 2002).

The overall objectives of the Basic Science and Technology curriculum according to Adeniyi (2017) are to enable the learner to:

- i. develops interest in science and technology;
- ii. acquire basic knowledge and skill in science and technology;
- iii. apply their scientific and technological knowledge and skill to meet societal needs;
- iv. take advantage of the numerous career opportunities offered by science and technology;
- v. become prepared for further studies in science and technology.

Science plays an important role in the society because it relates to our daily life and to every career. Our daily life activities and career are the products of scientific knowledge, and thinking. Science helps to construct further knowledge and understand phenomena, which are the consequences of the tremendous development of technology (Ezeh, 2013). Based on the numerous importance of science, Nigerian government through the Federal Ministry of Education recommended the teaching of science subjects in primary school of which Basic Science and Technology is one of them.

Despite the relevance of the study of Basic science and technology as a subject in the schools and its' importance to human, the poor achievement in Basic Science and Technology as indicated by various empirical studies Betiku, 2001; Omole, 2002 respectively, have attracted the concern of all stakeholders including the researchers.

Subsequently many factors have been identified and regarded as being responsible for the dwindling trend in the performance of students. These factors include school- teacher-related characteristics, teaching methods, social incentives, and a host of others (Olatoye, 2002; Ogunkola, 2020). This suggests that if the afore listed factors can be taken into consideration, pupils will excel more in Basic Science and Technology and highly motivated in the subject. The way pupils are taught in schools often affects learning of Basic science and technology. Ifeakor (2019) pointed out that most of the time Basic Science and Technology is taught to the pupils using ineffective methods instead of hands on approach. According to Etuk (2011), the continued use of the ineffective teaching method to teach in our schools reduces the ability of pupils to grasp relevant concepts than when exposed to lessons involving hands on experience. Appropriate teaching methods will lead the pupils to acquire appropriate scientific skills, which may likely enhance pupils' achievement in science. However, most Basic science and technology teachers do not use appropriate teaching methods, rather they resort to the conventional (lecture) methods, which may not enhance pupils' achievement.

Teaching can be defined as a systematic process of transmitting knowledge, attitudes and skills in accordance with professional principles. In the traditional setting, many teaching practitioners widely apply the conventional methods otherwise called the teacher-centered method to impart knowledge to learners comparative to pupil – centered methods. Conventional method is a way of teaching in which the teacher or instructor provides information to the pupils up front, without much interaction from the pupils' side, except for answering question. Conventional method is direct instruction where a teacher is in the front of the classroom lecturing and pupils are taking notes. In this teaching method, the teacher presents pupils with the subject matter rules and provides examples that illustrate the rules. Then such pupils are told what they need to know. In this method, the teacher focuses the pupils' attention on the key points of the subject and may use graphics, diagrams or other presentations to elaborate on the subjects. Boud and Feletti (2019) states that pupils simply obtain information from the teacher without building their engagement level with the subject being taught.

The teaching methods used by teachers determine the extent to which students perform in their academics, for the process of teaching to be successful, teachers should apply instructional strategies that can best transfer information to the learners for getting the best outcome. Traditionally, many teachers apply teacher-centered strategies to transfer knowledge to the learners as compared to the learner-centered strategies. Etim (2020) noted that the failure rate in science subject in Nigerian schools is claiming an exponential rate in Akwa Ibom State. This situation the author attributed to the blame game and the outcry by government, parents and teachers on the poor quality of products produced from our schools without any of the stakeholders taking responsibility. In a related research, Ibe-Bassey (2012) stated that, the decrease in the academic performance of students at all levels of education in the major school subjects are due to the challenges the students'

faces, ranging from the teachers, students to the teaching strategies adopted by teachers, government policies to institutional policies.

Etim (2020) posited that the traditional non-flexible instructional strategies used by many science teachers could not as it is achieve the desired instructional objectives in this 21st century. The author argued that flexible instructional strategy becomes highly imperatives because of the inherent advantage embedded in it such as providing instruction very fast to millions of students at the same time and more effectively too. According to Archibong (2020), the interest, which students show in science subjects, and the mastery they demonstrate on completion of a course of study depend on the teaching methods and materials used. According to Wood and Gentile, (2003) there are improved methods to transfer knowledge to learners than through the traditional strategies. There is good reason to develop new ways of teaching that would enhance the subject and excite students. New teaching tools can have a profound impact in the classroom.

According to Hesson and Shad, (2017) most teachers today apply the pupil centered approach of teaching to promote interest, analytical research, critical thinking and enjoyment among students. The teaching method is regarded more effective since it does not centralize the flow of knowledge from the lecturer to the student. Daluba (2013) opined that for better performance of students, the use of activity stimulating and student-centered approach of learning should be adopted/embraced instead of depending on the conventional expository approach like lecture method. Teo and Wong (2018) emphasized that the approach of expository method is least practical, more theoretical and memorizing. It does not apply activity based learning to encourage students to learn real life problems based on applied knowledge. Since the teacher controls the transmission and sharing of knowledge, he should attempt to maximize the delivery of information while minimizing time and effort. As a result, both interest and understanding of students may get lost. To address such shortfalls, Zakaria, Chin and Daud (2010) specified that, teaching should not merely focus on dispensing rules, definitions and procedures for students to memorize, but should also actively engage pupils as primary participants. Daluba (2013) opined that for better performance of pupils, the use of activity stimulating and pupil-centered approach of learning should be adopted/embraced instead of depending on the conventional method. This would enhance the development of science process skills, which will led to the development of scientific attitude and enable the pupils to construct knowledge on their own, which is what constructivism is all about.

Constructivism is a theory that explains how knowledge is constructed in the human being when information encounters existing knowledge that had been developed by experiences. It is an approach to education that lays emphasis on the ways knowledge is acquired in order to adapt to the world. According to Agulanna and Nwachukwu (2014) constructivism is an active, contextualized process of constructing knowledge rather than acquiring it. According to the authors, knowledge is constructed based on personal experiences and hypotheses of the environment. Learners continuously test these hypotheses through social negotiation. Each person has a different interpretation and construction of

knowledge. The learner is not a blank slate (*tabula rasa*) but brings past experiences and cultural factors to a situation. Constructivism has its roots in cognitive psychology and biology. It is an approach to education that lays emphasis on the ways knowledge is created in order to adapt to the world. Discovery, hands-on, experiential, collaborative, project-based, and task-based learning are a number of applications that base teaching and learning on constructivism (Awodeyi, 2005).

Constructivism is basically a theory based on observation and scientific study about how people learn. It states that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. When learners encounter something new, they have to reconcile it with their previous ideas and experience, maybe changing what they believe, or maybe discarding the new information as irrelevant. In any case, they are active creators of their own knowledge. To do this, learners must ask questions, explore, and assess what they know.

In the classroom, the constructivist view of learning can point towards a number of different teaching practices. In the most general sense, it usually means encouraging pupils to use active techniques (experiments, real-world problem solving) to create more knowledge and then to reflect on and talk about what they are doing and how their understanding is changing. The teacher makes sure she understands the pupils' pre-existing conceptions, and guides the activity to address them and then build on them. Constructivist instructional strategy according to Agulanna and Nwachukwu (2014) focuses on meaning making and knowledge construction and not mere memorization. In this approach the learner learns by personally and uniquely developing an understanding and making sense of information. The constructivist strategy is considered a veritable tool for shifting science teaching from the traditional chalk and talk method (lecture), which is teacher centered, to the hands-on method, which is learner-centered. Therefore, it focuses on problem - solving, constructing and reconstructing ideas and methods.

The constructivist teacher poses a problem and monitors pupil exploration, guides pupil inquiry, and promotes new patterns of thinking. Constructivist instructional approaches can be applied across learners of all ages, including adults. Constructivist view of learning recognizes the fact that pupils need time to: express their current thinking; interact with objects, organisms, substances, and equipment to develop a range of experiences on which to base their thinking (Brooks and Brooks, 2013). A constructivist instructional approach provides a built-in structure for creating a constructivist classroom. There are different models of constructivist instructional approach. These models range from 6Es, 7Es, and 5Es constructivist instructional approaches.

The 5Es is an instructional model based on constructivist approach to learning. This model arranges learning experiences so that pupils have the opportunity to construct their understanding of a concept over time. The Biological Science Curriculum Study (BSCS), a team led by Principal Investigator Roger Bybee, developed the instructional model for constructivism, called the "Five Es". Other models adapted from this model include the 6E and 7E models. The 5E's allows pupils and teachers to experience common activities, to use

and build on prior knowledge and experience, to construct meaning and to continually assess their understanding of a concept.

The 5E's describes a phase of learning that leads pupils through five phases of learning that is easily described using words that begin with the letter E: Engage, Explore, Explain, Elaborate, and Evaluate. First, engagement phase of the instructional model initiates the learning task. It makes connection between past and present learning experience. Here, activity should make connections between past and present learning experiences, anticipate activities, and focus pupils thinking on the learning outcomes of current activities. The pupil should become mentally engaged in the concept, process, or skill to be explored. Second, exploration phase provides pupils with a common base of experiences within which they identify and develop current concepts, processes, and skills. During this phase, pupils actively explore their environment or manipulate materials. Third, explanation phase focuses pupils' attention on a particular aspect of their engagement and exploration experiences and provides opportunities for them to verbalize their conceptual understanding, or demonstrate their skills or behaviour. This phase also provides opportunities for teachers to introduce a formal label or definition for a concept, process, skill or behaviour. Fourth, elaboration phase challenges and extends pupils conceptual understanding and allows further opportunity for pupils to practice desired skills and behaviour. Through new experiences, the pupils develop deeper and broader understanding, more information, and adequate skills. Lastly, evaluation phase of the teaching model encourages pupils to assess their understanding and abilities and provides opportunities for teachers to evaluate pupil progress toward achieving the educational objectives (Oludipe and Oludipe, 2010). The introduction of innovative teaching approach like the 5Es constructivist approach may help to enhance pupils' achievement irrespective of gender. Several empirical studies have shown that 5Es constructivist approach enhance pupils' achievement such among are; Tagbo (2014) similarly found that 5Es constructivist instructional approach was superior to conventional instructional method (lecture) in facilitating students' achievement and attitude to chemistry than the conventional lecture method. Tuna and Kacar (2013) also shared their experience of incorporating 5Es constructivist instructional approach in teaching trigonometry on students' academic achievement and the permanence of their trigonometry knowledge. The findings of the research showed that the experimental group students' scores of academic achievement and permanence of trigonometric knowledge are higher than those in the control group are. The difference between these groups is statistically significant and is in favour of the experimental group. Oludipe and Oludipe (2010) concluded that the use of 5Es constructivist instructional strategy in the classroom would increase the attention of the pupils through the classroom participation.

Gender is the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between feminine and masculine (female and male) population. Mangvwat, (2019) stated that Gender is a specially constructed phenomenon that is brought about as society ascribes different roles, duties, behaviour, and mannerisms

to the two sexes. It is a social connotation that has sound psychological background, and it is used to refer to specific cultural patterns of behaviour that are attributed to human sexes. Gender relates to cultural attributes of both males and females Akpochafo, (2020). The importance of examining the performance of pupils in relation to gender is based primarily on the socio-cultural differences between girls and boys. Blume (2020) explained that males and females rarely compete against each other because of some significant differences in physical make-up. These differences are observed in the bones, pelvic, body fat, muscle mass and physiological composition. These differences are believed to affect the performance, attitude behaviour and achievement of males and females. Gender characterized the differing role, responsibilities, constraints, opportunities and needs of females and males in all areas and in any given social context. Studies from Amedu (2015) have documented that female students have lower self-efficacy in science subjects compared to their male counterparts. Cooper (2012) posited that there is gender differences in performance as far as creativity are concerned. Filgona (2016) reports that science, as a course is gender sensitive. Ogunkunle (2011) found that there is no difference in the students' involvement in mathematics activities because of their gender. In the same vein, this Olasehinde and Olatoye (2014) found that there was no significant difference between male and female students in overall science achievement, attitude to science also biology, chemistry and physics achievements.

Academic retention is the ability to store what has been learnt and recall what has been stored in the memory. According to Olarewaju (2017), academic retention is the ability to retain and later remember information or knowledge gained after learning in to memory. Retention could be explained as the process or ability to retain and remember things and experiences learned by an individual at a later time. Appropriate coding of incoming information provides the index that may be consulted so that retention takes place without an elaborate search in the memory lane. The level of academic retention is mostly determined by the teaching strategy used in the teaching and learning process, the nature of the materials used for the delivery of the instruction, which is to be coded, also contributes to the level of retention. Wushishi, Danjuma and Usman, (2017) stated that instructional strategies contribute to quality and level of academic retention in terms of meaningful, concreteness and image evolving characteristic. The role of the teacher is that of a facilitator. The teacher encourages the learner to discover things for themselves this could increase the retention ability of pupils towards certain concepts. Learning retention in respect to this study is the ability of the pupils to acquire and comprehend the concepts of Basic Science and Technology. Isa (2012) found that students exposed to constructivist instructional approach achieved, retained the learnt concept and developed positive attitude to physics than their counterpart taught with conventional lecture method. Similarly, Bunkure (2012) study revealed that students exposed to constructivist instructional strategy achieved, retained the learnt concepts and developed more positive attitude to physics than their counterparts exposed to conventional method of teaching.

The strategy is suitable for pupils' of varied ability levels. Gumel and Galadima (2014) found no significant difference in male and female performance in Geometry Retention-Test.

Statement of Problem

The teaching of Basic Science and Technology as a subject in primary schools is not without its problems. These problems, ranging from government, teachers and pupil-related problems do not differ with the problems bedeviling the entire education system in Nigeria. Poor academic performance of pupils in all subjects and Basic Science and Technology in particular has been a source of concern to many researchers. Since academic performance is being used as one of the predictors of overall quality of the education system, it may not be out of place to say that where there is inadequate or poor funding of schools, there may be inadequate instructional materials, poor infrastructural facilities, poor teaching learning environment and poor motivation of teachers among others. As such, pupils see Basic Science and Technology as a collection of mere ideas presented as facts. They find scientific concepts confusing and unfamiliar. Pupils therefore, learn scientific concepts in abstract form and are subjected to too much imagination of scientific features instead of learning through active involvement.

Although Basic Science and Technology has continued to occupy a place among the subjects taught in primary schools in Nigeria, much of the interests and enthusiasm, which decked the subject, have waned in recent years. The poor performance in Basic Science and Technology has been linked to many variables such as poor teacher and pupils' relationship, teachers' teaching method, learning materials, teachers' and pupils' attitude and teaching and learning methods among others.

The researcher observes that most of the teachers in Akwa Ibom South Senatorial District are plagued with these problems bedeviling the educational sector and also they still rely primarily on the traditional expository chalk and talk method of teaching Basic Science and Technology, which has also contributed in making the students lose interest and enthusiasm. The researcher also observes that, most teachers do not utilize materials in teaching Basic Science and Technology so as to arouse the pupils collaboration and participation in the learning process, on noticing the low level interest in Basic Science and Technology and the poor academic performance in Basic Science and Technology, it is on this premise that this study is necessitated to find out if the use of 5Es constructivist instructional strategy can enhance the academic performance of pupils in Basic Science and Technology in Akwa Ibom South Senatorial District.

Purpose of the Study

The purpose of this study was to determine the effect of 5Es constructivist instructional strategy on academic performance of pupils in Basic Science and Technology in Akwa Ibom South Senatorial District. Specifically, the study sought to;

- i. Ascertain the difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- ii. Ascertain the difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- iii. Determine the difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- iv. Determine the difference in the male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- v. Determine the difference in the male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- vi. Determine the difference in the male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Research Questions

The following research questions were raised to guide the study

- i. What is the difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?
- ii. What is the difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?
- iii. What is the difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?
- iv. What is the difference in the male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?
- v. What is the difference in the male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?
- vi. What is the difference in the male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Hypotheses

The following null hypotheses were postulated to guide the study and were tested at .05 level of significance:

- H₀₁:** There is no significant difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- H₀₂:** There is no significant difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- H₀₃:** There is no significant difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- H₀₄:** There is no significant difference in the male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- H₀₅:** There is no significant difference in the male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.
- H₀₆:** There is no significant difference in the male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Materials and Methods

The research design adopted for this study was quasi-experimental research design. Specifically, it is a pretest – post-test non-equivalent control group design. The population of the study consisted of all 12,080 primary school pupils in 282 public primary schools. The study sample consisted of 240 primary three pupils from eight intact classes was used in the study (116 males and 124 females) selected through multi-stage sampling technique. The instrument used in gathering data was Basic Science and Technology Performance Test (BSTPT). The BSTPT has two sections, A and B. Section A contains the pupils' personal data while section B contains a total of 20 multiple choice items. Each item had options (A-D) with only one correct option. Each correct option carried 2 marks, making a total of 40 marks. The "Basic Science and Technology Performance Test (BSTPT) was used to measure the pupils' performance in both pre-test and post-test. Also, the researcher developed the two lesson plans on 5Es Constructivist Instructional Strategy and Talk and Chalk Method as treatment packages. Basic Science and Technology Performance Test (BSTPT) had a reliability index of 0.74 determined using Kuder-Richardson Formula-20. The treatment group was taught scientific concepts with 5Es constructivist instructional strategy while the control group was taught the same concepts using conventional method (talk and chalk) with the help of two trained research assistants who were class teachers in the selected classes. The classroom investigation, which lasted for four weeks and was strictly

supervised by the researcher. At the end the Basic Science and Technology Performance Test (BSTPT) was re-administered as post-test. Two weeks later the Basic Science and Technology Performance Test (BSTPT) was again re-administered as retention test. Data collected were analyzed using Analysis of Covariance (ANCOVA) with pre-test scores as covariates. All hypotheses were tested at .50 level of significance.

Results and Discussion

Research Questions One

What is the difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Table 1: Pretest- Posttest and mean difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Group	n	Pre-test		Post-test		Mean Difference
		$\bar{X}$	SD	$\bar{X}$	SD	
5Es constructivist	118	6.73	5.32	19.19	5.91	12.46
Conventional method	122	6.88	5.19	11.22	4.37	4.34

Source: Field work (2021).

The result in Table 4 shows the difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. The result shows that the pretest of pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy (experimental group) was 6.73 with a standard deviation of 5.32 and a posttest mean of 19.19 with a standard deviation of 5.91. The mean difference for pupils exposed to the experimental group was 12.46. On the other hand, the pretest of pupils' ability to describe scientific concepts when taught Basic Science and Technology using conventional method of teaching (control group) was 6.88 with a standard deviation of 5.19 and a posttest mean of 11.22 with a standard deviation of 4.37. The mean difference for pupils' ability to describe scientific concepts when taught Basic Science and Technology using conventional method of teaching (control group) was 4.34. From this result, it can be concluded that pupils' exposed to 5Es constructivist instructional strategy (experimental group) had higher ability to describe scientific concepts than those taught with expository method. This implies that the 5Es constructivist instructional strategy seems effective in enhancing pupils' ability to describe scientific concepts.

Research Question Two

What is the difference in pupils' ability to classify scientific concepts when taught Basic

Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Table 2: Pretest- Posttest and mean difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Group	n	Pre-test		Post-test		Mean Difference
		$\bar{X}$	SD	$\bar{X}$	SD	
5Es constructivist	118	6.69	5.19	13.72	5.99	7.03
Conventional method	122	6.84	4.98	10.94	4.32	4.10

Source: Field work (2021).

The result in Table 2 shows the difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. The result shows that the pretest of pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy (experimental group) was 6.69 with a standard deviation of 5.19 and a posttest mean of 13.72 with a standard deviation of 5.99. The mean difference for pupils exposed to the experimental group was 7.03. On the other hand, the pretest of pupils' ability to classify scientific concepts when taught Basic Science and Technology when taught with conventional method of teaching (control group) was 6.84 with a standard deviation of 4.98 and a posttest mean of 10.94 with a standard deviation of 4.32. The mean difference for pupils' ability to classify scientific concepts when taught Basic Science and Technology when taught with conventional method of teaching (control group) was 4.10. From this result, it can be concluded that pupils' exposed to 5Es constructivist instructional strategy (experimental group) had higher ability to classify scientific concepts when taught Basic Science and Technology when taught with conventional method of teaching. This implies that the 5Es constructivist instructional strategy seems effective in enhancing pupils' ability to ability to classify scientific concepts.

Research Question Three

What is the difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Table 3: Posttest- Retention and mean difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Group	n	Post-test		Retention		Mean Difference
		$\bar{X}$	SD	$\bar{X}$	SD	
5Es constructivist	118	31.65	9.47	38.97	9.61	7.31

Conventional method	122	23.72	7.05	29.22	6.39	5.50
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Source: Field work (2021).

The result in Table 3 shows the difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. The result shows that the posttest of pupils' performance on scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy (experimental group) was 31.65 with a standard deviation of 9.47 and pupils' ability to retain scientific concepts of 38.97 with a standard deviation of 9.61. The mean difference for pupils exposed to the experimental group was 7.31. On the other hand, the posttest of pupils' performance on scientific concepts when taught using Conventional method (control group) was 23.72 with a standard deviation of 7.05 and pupils' ability to retain scientific concepts of 29.22 with a standard deviation of 6.39. The mean difference for pupils exposed to the experimental group was 5.50. From this result, it can be concluded that pupils' exposed to 5Es Constructivist (experimental group) had higher ability to retain scientific concepts than those taught with conventional method. This implies that the 5Es Constructivist instructional strategy seems effective in enhancing pupils' ability to retain scientific concepts

Research Question Four

What is the difference in the male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Table 4: Pretest- Posttest and mean difference in male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Group	Gender	n	Pre-test		Post-test		Mean Difference
			$\bar{X}$	SD	$\bar{X}$	SD	
5Es constructivist	Male	57	7.36	5.75	19.38	6.20	12.02
	Female	61	6.80	5.40	18.11	5.85	11.31
Conventional method	Male	59	6.35	4.89	11.18	4.28	4.83
	Female	63	7.30	5.06	11.90	4.34	4.60

Source: Field work (2021).

Results in Table 4, shows the difference in male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. The result showed that the male pupils under 5Es constructivist instructional strategy had a pretest mean of 7.36 with a standard deviation of 5.75 and a posttest mean of 19.38 with a standard

deviation of 6.20. The difference between the pretest and posttest mean was 12.02. The female pupils had a pretest mean of 6.80 with a standard deviation of 5.40 and a posttest mean of 18.11 with a standard deviation of 5.85. The difference between the pretest and posttest mean for the girls was 11.31. For both male and female pupils in 5Es constructivist instructional strategy, the posttest means were greater than the pretest mean with male pupils having higher mean in ability to describe scientific concepts than female pupils.

In the same vein, Table 4.4 reveals that male pupils exposed to conventional method had a pretest mean of 6.35 with a standard deviation of 5.40 and a posttest mean of 11.18 with a standard deviation of 4.28. The difference between the pretest and posttest mean was 4.83. The female pupils on the other hand had a pretest mean of 7.30 with a standard deviation of 5.06 and a posttest mean of 11.90 with a standard deviation of 4.34. The difference between the pretest and posttest mean for the female pupils was 4.60. For male and female pupils exposed to Conventional method the posttest means were greater than the pretest means with male having slightly higher mean in ability to describe scientific concepts their than female' counterparts. However, for pupils exposed to experimental group (5Es constructivist instructional strategy) the mean difference were greater than the mean difference of pupils exposed to Conventional method. This implies that 5Es constructivist instructional strategy appears more effective in improving ability to describe scientific concepts in male and female pupils.

Research Question Five

What is the difference in the male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Table 5: Pretest- Posttest and mean difference in male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Group	Gender	n	Pre-test		Post-test		Mean Difference
			$\bar{X}$	SD	$\bar{X}$	SD	
5Es constructivist	Male	57	6.95	5.47	19.39	5.90	12.44
	Female	61	6.36	5.09	18.86	5.99	12.50
Convention method	Male	59	7.00	5.36	11.38	4.28	4.38
	Female	63	6.75	5.04	11.05	4.50	4.30

Source: Field work (2021).

Results in Table 5, shows the difference in the male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. The result showed that the male pupils under 5Es constructivist instructional strategy had a pretest

mean of 6.95 with a standard deviation of 5.47 and a posttest mean of 19.39 with a standard deviation of 5.90. The difference between the pretest and posttest mean was 12.44. The female pupils had a pretest mean of 6.36 with a standard deviation of 5.09 and a posttest mean of 18.86 with a standard deviation of 5.99. The difference between the pretest and posttest mean for the girls was 12.50. For both male and female pupils in 5Es constructivist instructional strategy, the posttest means were greater than the pretest mean with female pupils having higher mean in ability to classify scientific concepts than male pupils.

In the same vein, Table 4.5 reveals that male pupils exposed to Conventional method had a pretest mean of 7.00 with a standard deviation of 5.36 and a posttest mean of 11.38 with a standard deviation of 4.28. The difference between the pretest and posttest mean was 4.38. The female pupils on the other hand had a pretest mean of 6.75 with a standard deviation of 5.04 and a posttest mean of 11.05 with a standard deviation of 4.50. The difference between the pretest and posttest mean for the female pupils was 4.30. For male and female pupils exposed to conventional method the posttest means were greater than the pretest means with male pupils having slightly higher mean in ability to classify scientific concepts than female pupils. However, for male and female pupils exposed to experimental group (5Es constructivist instructional strategy) the mean difference were greater than the mean difference of male and female pupils exposed to Conventional method. This implies that 5Es constructivist instructional strategy seems more effective in improving male and female pupils' ability to classify scientific concepts.

Research Question Six

What is the difference in the male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching?

Table 6: Posttest - Retention and mean difference in male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Group	Gender	n	Post-test		Retention		Mean
			$\bar{X}$	SD	$\bar{X}$	SD	Difference
5Es constructivist	Male	57	30.38	6.20	31.78	4.67	1.46
	Female	61	28.11	5.85	30.45	6.32	2.34
Conventional method	Male	59	21.18	4.28	22.24	5.42	1.06
	Female	63	21.90	4.34	20.65	6.75	-1.25

Source: Field work (2021).

Results in Table 6, shows the difference in male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional

strategy and those taught with conventional method of teaching. The result showed that the male pupils under 5Es constructivist instructional strategy had a posttest mean of 30.38 with a standard deviation of 6.20 and retention of 31.78 with a standard deviation of 4.67. The difference between the posttest and retention mean was 1.46. The female pupils had a posttest mean of 28.11 with a standard deviation of 5.85 and retention mean of 30.45 with a standard deviation of 6.32. The difference between the posttest and retention mean for the girls was 2.34. For both male and female pupils in 5Es constructivist instructional strategy, the retention means were greater than the posttest mean with male pupils having higher mean in ability to retain scientific concepts than female pupils.

In the same vein, Table 4.6 reveals that male pupils exposed to conventional method had a posttest mean of 21.18 with a standard deviation of 4.28 and retention mean of 22.24 with a standard deviation of 5.42. The difference between the posttest and retention mean was 1.06. The female pupils on the other hand had a posttest mean of 21.90 with a standard deviation of 4.34 and retention mean of 20.65 with a standard deviation of 6.75. The difference between the posttest and retention mean for the female pupils was – 1.25. For male and female pupils exposed to Conventional method the posttest means were greater than the retention means with male having slightly higher mean in ability to retain scientific concepts than female' counterparts. However, for pupils exposed to experimental group (5Es constructivist instructional strategy) the mean difference was greater than the mean difference of pupils exposed to Conventional method. This implies that 5Es constructivist instructional strategy appears more effective in improving ability to retain scientific concepts in male and female pupils.

Hypothesis One

There is no significant difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Table 7: Analysis of Covariance (ANCOVA) of the difference in the mean scores pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4027.128 ^a	2	2013.564	77.060	.000
Intercept	17388.945	1	17388.945	665.483	.000
Ability to Describe Scientific Concepts Pretest	221.323	1	221.323	8.470	.004
Methods of Teaching	3831.005	1	3831.005	146.614	.000
Error	6192.768	237	26.130		
Total	65275.000	240			

Corrected Total 10219.896 239

a. R Squared = .394 (Adjusted R Squared = .389)

Source: Field work (2021).

The result in Table 4.7 shows that an F-ratio of 146.614 with an associated probability value of 0.000 was obtained with regards to the difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. Since the associated probability of 0.000 was less than 0.05, the null hypothesis (H_{01}) which states that there is no significant difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching was rejected. This implies that there is a significant difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Hypothesis Two

There is no significant difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Table 8: Analysis of Covariance (ANCOVA) of the difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	466.754 ^a	2	233.377	8.542	.000
Intercept	13319.012	1	13319.012	487.521	.000
Ability to Classify Scientific Concepts Pretest	1.112	1	1.112	.041	.840
Methods of Teaching	464.871	1	464.871	17.016	.000
Error	6474.808	237	27.320		
Total	43325.000	240			
Corrected Total	6941.563	239			

Source: Field work (2021).

The result in Table 8 shows that an F-ratio of 17.016 with an associated probability value of 0.000 was obtained with regards to the difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. Since the associated probability of 0.000 was less than 0.05, the null hypothesis (H_{02}) which states that there is

no significant difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching was rejected. This implies that there is a significant difference in pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Hypothesis Three

There is no significant difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Table 9: Analysis of Covariance (ANCOVA) of the difference in the mean scores of pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	38124.813 ^a	2	19062.407	750.025	.000
Intercept	2624.178	1	2624.178	103.250	.000
Posttest Sc. Concepts	9740.428	1	9740.428	383.245	.000
Methods of Teaching	1770.598	1	1770.598	69.666	.000
Error	6023.520	237	25.416		
Total	642150.000	240			
Corrected Total	44148.333	239			

a. R Squared = .864 (Adjusted R Squared = .862)

Source: Field work (2021).

The result in Table 9 shows that an F-ratio of 69.666 with an associated probability value of 0.000 was obtained with regards to the difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. Since the associated probability of 0.000 was less than 0.05, the null hypothesis (H_{03}) which states that there is no significant difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching was rejected. This implies that there is a significant difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Hypothesis Four

There is no significant difference in the male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Table 10: Analysis of Covariance (ANCOVA) of the difference in male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3238.029 ^a	4	809.507	29.910	.000
Intercept	17843.397	1	17843.397	659.276	.000
Ability to describe Scientific Concepts Pretest	89.779	1	89.779	3.317	.070
Methods of Teaching	3082.476	1	3082.476	113.891	.000
Gender	5.342	1	5.342	.197	.657
Methods of Teaching * Gender	48.992	1	48.992	1.810	.180
Error	6360.304	235	27.065		
Total	64200.000	240			
Corrected Total	9598.333	239			

a. R Squared = .337 (Adjusted R Squared = .326)

Source: Field work (2021).

The result in Table 10 shows that an F-ratio of 1.810 with an associated probability value of 0.180 was obtained with regards to the difference in pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. Since the associated probability of 0.180 was greater than 0.05, the null hypothesis (H_0) which states that there is no significant difference in male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching was retained. This implies that there is no significant difference in male and female pupils' ability to describe scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Hypothesis Five

There is no significant difference in the male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Table 11: Analysis of Covariance (ANCOVA) of the difference in the mean scores of male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4034.486 ^a	4	1008.621	38.320	.000
Intercept	17209.533	1	17209.533	653.835	.000
Ability to describe Scientific Concept Pretest	217.634	1	217.634	8.268	.004
Methods of Teaching	3651.962	1	3651.962	138.748	.000
Location	7.218	1	7.218	.274	.601
Methods of Teaching * Location	.254	1	.254	.010	.922
Error	6185.410	235	26.321		
Total	65275.000	240			
Corrected Total	10219.896	239			

a. R Squared = .395 (Adjusted R Squared = .384)

Source: Field work (2021).

The result in Table 4.11 shows that an F-ratio of 0.10 with an associated probability value of 0.922 was obtained with regards to the difference in male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. Since the associated probability of 0.922 was greater than 0.05, the null hypothesis (H_0) which states that there is no significant difference in male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching was retained. This implies that there is no significant difference in male and female pupils' ability to classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Hypothesis Six

There is no significant difference in the male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Table 12: Analysis of Covariance (ANCOVA) of the difference in male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es

constructivist instructional strategy and those taught with conventional method of teaching

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3238.029 ^a	4	809.507	29.910	.000
Intercept	17843.397	1	17843.397	659.276	.000
Ability to retain Scientific Concepts Posttest	89.779	1	89.779	3.317	.070
Methods of Teaching	3082.476	1	3082.476	113.891	.000
Gender	5.342	1	5.342	.197	.657
Methods of Teaching * Gender	48.954	1	48.954	1.808	.182
Error	6360.906	235	27.067		
Total	64200.000	240			
Corrected Total	9598.333	239			

b. R Squared = .337 (Adjusted R Squared = .326)

Source: Field work (2021).

The result in Table 12 shows that an F-ratio of 1.808 with an associated probability value of 0.180 was obtained with regards to the difference in pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching. Since the associated probability of 0.182 was greater than 0.05, the null hypothesis (H₀₆) which states that there is no significant difference in male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching was retained. This implies that there is no significant difference in male and female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching.

Discussion of Findings

The analysis of hypothesis one and two reveal that there was a statistically significant effect of the teaching methods used on the performance of pupils in Basic Science and Technology in favour of the pupils taught with 5Es constructivist instructional strategy. This result may be due to the fact that effective teaching and learning in any subject at any institution are dependent on the teaching methods used. The finding agrees with the findings of related study by Ibrahim (2015) investigated the impact of 5E teaching cycle on attitude, retention and performance in genetics among Pre-NCE Biology Students with Varied Abilities in North-West Zone, Nigeria. From the analysis of data, it was discovered that pre-NCE Biology students exposed to 5E teaching cycle in the teaching and learning of genetics concepts in all the ability levels had higher mean performance scores and also retain more than those in the control group exposed to lecture method of instruction.

The finding is tandem with that of Tagbo (2014) who found that 5Es constructivist instructional approach was superior to conventional instructional method (lecture) in facilitating students' achievement and attitude to chemistry than the conventional lecture method. This study added to the literature base in that the innovative pupil-centred teaching methods can improve the performance of pupils' learning as confirmed in studies carried out by Tuna and Kacar (2013) who shared their experience of incorporating 5Es constructivist instructional approach in teaching trigonometry on students' academic achievement and the permanence of their trigonometry knowledge. The results from the study showed that findings of the research showed that the experimental group students' scores of academic achievement and permanence of trigonometric knowledge are higher than those in the control group are. The difference between these groups is statistically significant and is in favour of the experimental group. This finding corroborates with the ones of (Cramer, 2012; Sakalli, 2012; Oludipe and Oludipe, 2010; Jiya, 2011; Umahaba, 2011). The researcher then concluded that the use of 5Es constructivist instructional strategy in the classroom would increase the attention of the pupils through the classroom participation.

The analysis of hypothesis three reveals there was a statistically significant effect of the teaching methods used on the retention of pupils' ability to retain scientific concepts in favour of the pupils taught with 5Es constructivist instructional strategy. The finding is in line with that of Isa (2012) who investigated on the effect of constructivist based instructional approach based on 5Es learning model on academic achievement, retention and attitude to physics among secondary school students of different ability levels in Kano state, Nigeria. From the findings of this study, students exposed to constructivist instructional approach achieved, retained the learnt concept and developed positive attitude to physics than their counterpart taught with conventional lecture method. Similarly, the finding of this study is supported by Bunkure (2012) who revealed that students exposed to constructivist instructional strategy achieved, retained the learnt concepts and developed more positive attitude to physics than their counterparts exposed to conventional method of teaching. The strategy is suitable for pupils' of varied ability levels.

The effect of teaching methods on pupils' performance in ability to describe and classify scientific concepts was not statistically influenced by gender. Hence, hypothesis four and five which assumed no significant difference in female pupils' ability to describe and classify scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching in Akwa Ibom South Senatorial District was retained. This finding was so because in Table 4 showed that male pupils had higher mean in ability to describe and classify scientific concepts than female pupil and the teaching methods appear more effective in improving ability to describe and classify scientific concepts in both male and female pupils, which implied that the model is gender friendly. This finding agrees with that of Ogunkunle and Gbamanga (2019)) in their studies found that there is no difference in the students' involvement in

mathematics activities because of their gender. In the same vein, this finding is in accordance with Olasehinde and Olatoye (2014) who carried out a study on comparison of male and female senior secondary school students' learning outcomes in science in Katsina State and found that there was no significant difference between male and female students in overall science achievement, attitude to science also biology, chemistry and physics achievements. This implies that teachers should evoke instructional strategies that will sustain the gender equality in students' learning outcomes in science. The finding of this study contradicts with that of Nnamani and Oyibe (2016) who found that there were significant difference in the mean achievement of secondary school pupils in Social Studies based on gender. Oludipe and Oludipe (2010) found that male students had higher mean achievement and attitude to integrated science than their female counterparts did. The effect of teaching methods on pupils' performance in ability to retain scientific concepts was not statistically influenced by gender. Hence, hypothesis six which assumed no significant difference in female pupils' ability to retain scientific concepts when taught Basic Science and Technology using 5Es constructivist instructional strategy and those taught with conventional method of teaching in Akwa Ibom South Senatorial District was retained. This finding is in tandem with Gumel and Galadima (2014) who found no significant difference in male and female performance in Geometry Retention-Test. Bunkure (2012) found that a no significant difference in students' retention with reference to gender.

Conclusion

As a result of the findings in this study, it could be concluded that a better understanding and retention of scientific concepts in Basic Science and Technology was provided by 5Es constructivist instructional strategy. This because all primary three pupils exposed to it, showed better performance, better retention ability when compared to those not exposed to it. When the effect of gender on pupils' performance and retention subject was investigated, it was found that there was no significant difference between male and female with respect to performance and retention when taught with 5Es constructivist instructional strategy. This showed that 5Es constructivist instructional strategy is gender friendly.

Recommendations

On the basis of findings emanating from this study, the following recommendations were made:

- The teaching of Basic Science and Technology should be conducted using 5Es constructivist instructional strategy as it make pupils learn meaningfully, enhances better retention of knowledge and develop positive attitude towards the subject. It should therefore be incorporated into the main stream of pedagogy in the teaching of pre-service teachers education. Also, appropriate learning environments should be provided for the pupils in order for the effective application of 5Es constructivist

instructional strategy in the classroom. To implement an activities based learning cycle, this requirement needs to be met in all schools.

- This study showed that gender does not play a significant role in the learning of scientific concepts, retention of knowledge among primary school pupils using 5Es constructivist instructional strategy. Hence, the method is recommended, as it is gender friendly and aided learning between male and female.
- 5Es constructivist instructional strategy encourages better retention of learnt concepts of primary school pupils. It should therefore be used regularly in the teaching and learning situation.
- In-service training for teachers in form of seminars, workshops -conferences should focus more on how to use 5Es constructivist instructional strategy for the teaching of scientific concepts. The government or relevant professional bodies like Science Teachers' Association of Nigeria (STAN) could do this.
- There should be proper provision of facilities/equipment, which are necessary for effective 5Es constructivist instructional strategy.
- In addition, the use of talk and chalk method by classroom teachers especially Basic Science and Technology should be minimized and done with caution to avoid poor performance and negative attitude among pupils to scientific concepts. The use of talk and chalk method of teaching has been found to be less effective in this study with respect to academic performance.

Suggestions for Further Studies

- A similar study on pupils of varied abilities should be carried out focusing on the teaching of other subjects using 5Es constructivist instructional strategy with a view to finding out if similar or different results as in this study may be obtained.
- There is need to conduct similar studies to investigate the effects of other activity oriented teaching methods such as problem-solving method, project method, discussion

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