CONSTRUCTIVISM AS A PARADIGM FOR TRANSPOSING THE TEACHING AND LEARNING OF BASIC SCIENCE AND TECHNOLOGY IN SECONDARY SCHOOLS

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ABSTRACT

There is great concern on students learning outcome in Basic Science which has attracted attention of many researchers with how learning is carried out in classrooms. This study investigated the use of constructivism as a theory for teaching and learning of Basic Science in schools. A video was developed and used for dynamic teaching and learning of Basic Science in some secondary schools in Anambra State, while some schools were taught by conventional method. The design used for the study was quasi-experimental which consisted pretest and post-test. This was to establish equivalence in the scientific and technological abilities of the students. Population of the study was all the one hundred and forty-five (145) schools in Aguata zone of Aguata L.G.A. of Anambra State. Random Sampling Technique was used to draw Fifty (50) schools out of one hundred and forty-five (145) schools in Aguata zone of Aguata L.G.A. of Anambra Sate. The questions for the test were drawn from a past question paper from JWASSCE. The findings showed that constructivism is an effective theory that enriches and improves students learning in Basic Science. Hence transposing the teaching and learning of Basic Science through constructivism is a plus in schools in Nigeria.

Keywords: Constructivism, Transposing, Teaching, Learning, Basic Science.

INTRODUCTION

Poor performance in Basic Science over the years has been attributed to reasons like; nature of the subject itself Adetula, (2010), the design of the curriculum Badmus (2012), teachers' characteristics Badmus (2012) and learner's characteristics Obodo, (2017). The methods of instruction used in fostering understanding of basic science concepts have not changed (he situation. The various research work that have been carried out over the years have not addressed how the learners are involved in the learning process. Despite these, science had been a tool for describing the whole world and for so many years, it had been involved in the development and advancement of science, technology has changed science and science had influenced technological endeavors. A sound background in basic science has accelerated the current knowledge explosion we are witnessing. Basic science plays an important role in objectivity, and accurate communication in scientific work Fajemidagba (2014).

Scientific and technological development cannot do without the sophisticated tools in basic science. A good mastery of basic science is important in understanding the world around us. While the nation is striving towards Scientific and Technology Literacy (STL), a strong background for students in basic science will be an excellent preparation for a wide variety of careers in areas of aviation, communication, computer, engineering, to mention a few transforming human lives in recent times Omotayo, Ihebereme, Maduewesi (2016). What is

worrisome is the nature which the teaching and learning of basic science takes. Most teaching is done *by* unqualified teachers, and usually devoid of true life experiences Lassa, (2016). It is usually characterized by memorization of formulae, reasoning in abstract terms without reference to happenings in the immediate environment. Olarewaju (2014) opined that, the way students learn is as important as what they are learning. The selection and proper usage of appropriate and most effective method like constructivism epistemology, highlights the central role of learners in the learning process. This is because children's reasoning depends on their general level of development and the experiences they have in similar situations.

Children start learning by constructing facts rather than retrieving them. The development of mathematical understanding in any child is influenced by culture, curriculum and classroom practice. Hence the ability for one to acquire knowledge in science depends on one's existing knowledge which makes the understanding of subsequent ideas for a particular concept easier. The teacher can make clear and rational decisions about how to interact with the cultural environment so that students can confront their own misunderstanding and rebuild an idea and in the process come closer to the desired meaning. This is true of constructivism which emphasizes the importance of knowledge, belief and skills that individuals bring to the experiences of learning. The elements of constructivism portrayed by teachers, make them negotiate, facilitate, construct, mediate, socialize, provide experiences as well as making cultural tools of science available to their students at all times. Particular interest is on science, technology and ourself concepts since most students find it difficult to comprehend this topic Yager (2015).

Constructivism and Learners in Basic Science

Although, students' learning is done independently, students are expected to learn the same concepts. This is done by allowing each student to construct" his/her own unique meaning through each one's cognitive processes. Phillips (2012) identifies three (3) distinct roles of learners in constructivism. These are:

1. the active learner, knowledge and understanding as actively acquired.
2. the social learner, knowledge and understanding as socially constructed and
3. the creative learner, knowledge and understanding as created or recreated.

An active role for the learners is basic. In practice, social and creative aspects often accompany this role. This is why priority should be focused on students1 understanding resulting from increased learning. Learners search for understanding that motivates them to learn more. Various activities and interactions are made possible and also serve as a basis for further activity. The teacher -gives instruction using an established language. This language is shared and creates knowledge and understanding, hence fulfilling the prime justification for setting up the education system. Mercer (2011), contends, this is the process of guided construction of knowledge to be carried out effectively. Ogunkunle (2004) noted that, students that participate in constructivist approach to learning perceive more meaningful learning experience and in some cases actually learn more than students in conventional learning situation. This is in agreement with Perkins (2012) position that constructivist learning experience exert high cognitive demands on learners but not all learners respond well to these challenges. This can be attributed to the differences between students in their homes, parent-child relationship, and parents' attitude towards doing well at school. All these have a marked influence in fostering and reinforcing the child's achievement-related-efforts at school Odetoyinbo (2004)

Statement of Problem

Learning of Basic Science for understanding As well as integrating it for future use is not reflected in most schools. This is because teaching is done in a hurry to meet examination deadlines, without recognizing the level of understanding in Basic Science among the students. Learners simply learn by memorizing facts passed on to them by their teachers without partaking in the learning process per se. Repositioning the teaching and learning of basic science in schools through constructivist strategy was carried out in this study. Constructivist learning enables meaningful learning, fasting as well as transferable to other contexts. The research problem of special interest in the present study was the extent to which the videos and hands-on might be a-fruitful source of effective instructional approaches to boosting Nigerian students' performance in junior secondary basic science.

Research Questions

1) To what extent are the students' performance in the experimental and control groups reflected in their learning of science, technology and ourself?
2) To what extent are students' attitude in basic science reflected in the constructivist and non-constructivist groups'.'

Hypotheses

Ho1: There is no significant difference between the mean score for performance of students in experimental group and control group.
Ho2: There is no significant difference between the male and female students' attitude to Basic Science in the experimental group and control group.

Methodology

The design used for the study was quasi-experimental which consisted pretest and post-test. This was to establish equivalence in the scientific and technological abilities of the students. Population of the study was all the one hundred and forty-five (145) schools in Aguata zone of Aguata L.G.A. of Anambra State. Random Sampling Technique was used to draw Fifty (50) schools out of one hundred and forty-five (145) schools in Aguata zone of Aguata L.G.A. of Anambra Sate. The questions for the test were drawn from a past question paper from JWASSCE. The time for classroom interaction-was one (1) week in each of the schools visited.

Procedures used in delivery of instruction

Videos on the concepts were downloaded via YouTube and there was hands-on during the process of teaching. The learning environment was a normal science classes and science laboratory for visual and hands-on activities. The content in the basic science curriculum that is the focus of this study is Science, technology and ourselves. This is practicalized with the use of computers, apparatus and specimens in the laboratories. The participants' behavior includes: students' attitude, student involvement, teacher involvement and teachers pedagogical practice. This is so because in a constructivist strategy, students' involvement is actively exhibited during the learning process. The teachers' pedagogical practice and the extent of the teachers' involvement during instruction will determine whether the class exhibited characteristics of a constructivist class. Finally, the learning outcome for this study was measured through a test to give the basic science performance of the students.

Results and Discussion

Research Question 1: To what extent are the students' achievement in the constructivist and non-constructivist group reflected in their learning on science, technology and ourself?

Table 1: Mean Scores for Achievement of the Students in the Two Groups

		PRE-TEST		POST TEST	
Groups	N	$\overline{X}$	SD	$\overline{X}$	SD
Experimental	380	41.5694	9.2397	64.3248	13.5064
Control	380	41.8750	9.5013	58.3302	10.1524

Table I shows that there is a difference in the mean score for performance during post-test of the students in the experimental group and control group. The student in the experimental group had a high mean score than their counterpart in the control group. This can be attributed to the exposure they had in learning using videos and hands-on.

Research Question 2: To what extent are the student's attitude reflected in the constructivist and non-constructivist groups?

Table 2: Students attitude to Basic Science in the Two Groups

Groups	N	$\overline{X}$ of Male	$\overline{X}$ of Female
Experimental Group	380	30.5883	30.1788
Control Group	380	31.7676	31.4000

The table above exhibits a significant difference on the groups. The students in the control group exhibit higher attitude to learning of Basic Science than their counterparts in the experimental group. These might be due to anxiety for them to be introduced to using videos for learning.

Hypotheses

Ho1: There is no significant (P< 0.05) difference between the mean scores of students exposed to the videos and that of those not exposed to videos.

Table 3: ANOVA Showing Pretest and Posttest Mean Scores of Students in the Two Groups

Source	DF	Sum of Squares	Mean Squares	F Prob.	
Between Groups	3	151540.4687	50513.4896	.0000	Sig.
Within Groups	1436	159797.0139	111.2793		
Total	1439	311337.4826			

The table shows significant difference in the mean score for the pretest and posttest of students in the constructivist and non-constructivist groups. Specifically, the students in the posttest and constructivist group differ significantly from all other groups and have a mean score at 64.33. There are also significant differences between the posttest non-constructivist students who had a mean score of 58.2 and (hose of pretest constructivist group with mean score of 41.57 and pretest non constructivist group with a mean score of 40.88, the null hypothesis was thereby rejected.

Hypothesis 2: There is no significant (P< 0.05) difference between male and female students' attitude to Basic Science in the constructivist group and non-constructivist group.

Table 4: ANOVA Showing Students' Attitude to Basic Science in the Two Groups

Source	DF	Sum of Squares	Mean Squares	F Prob.	
Between Groups	3	300.6777	100.2257	.0003	Sig.
Within Groups	716	11162.5223	15.5901		
Total	719	11463.2000			

The table shows a significant difference between male and female students attitude to basic science. In a posttest, significant difference was exhibited between female students in the control groups with mean points of 3 1.4 and all students in the experimental groups. Also the male students in the control group with a mean point of 31,77 and all students in the experimental group. Hence the null hypothesis was rejected.

DISCUSSION OF RESULTS

Constructivist strategy for teaching and learning of basic science in schools was carried out. There was significant difference exhibited by means scores of students in the constructivist group over their counterparts in the non-constructivist group. This conforms with the views Yager (2015) that learning through constructivist strategy paves way for meaningful learning. This could also be attributed to active participation by students in basic science activities, which also serves as a motivating factor in learning basic science amongst students. There was also a significant difference in the attitude of male and female students towards basic science.

Summary

The study had shown that the use of videos and hands-on are worthy innovation in the teaching and learning of basic science in schools. There were significant differences observed between the mean scores of experimental groups and control groups. There were also significant differences observed between male student's attitude to basic science in the experimental group and all the students in the control group as well as female student's attitude to basic science in the experimental group and all the students in control group.

Recommendation

From the results, the following recommendations were made,

1. The use of constructivist strategy in different learning environments like the basic science and technology laboratories will complement the use of existing basic science classrooms.
2. This will contribute significantly to the repositioning of teaching and learning of basic science in Nigeria.
3. Teachers should also provide opportunities for active participation among their students for meaningful learning in basic science.
4. The National Scientific Centre (NSC) should explore avenues for short term vacation courses for basic science teachers at the national level.

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