Effects Of Constructivist Model Of Instruction On Students' Academic Performance In Secondary Schools In Ekiti State, Nigeria

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***Abstract*—The study investigated the effects of Constructivist Model of Instruction on Students' Academic Performance in Secondary Schools in Ikere local Government Area, Ekiti State, Nigeria. This study used quasi-experimental design. The experimental study employed pre-test and post-test treatment. The sample for the study was 60 Senior Secondary Two (SSII) Physics students (this sample was divided into the experimental and control groups in ratio 1: 1 i.e. 30 in each group), selected through purposive random sampling technique from four public secondary schools out of a total population of 87 SS II students offering Physics in all the 10 public Senior Secondary Schools in Ikere Local Government Area, Ekiti State. The experimental group comprises of 18 males and 12 female SSII students from 2 secondary schools. The instrument used to collect relevant data from the subjects was Physics Achievement test (PAT). The instrument was subjected to validity and reliability mechanism. The reliability of the instrument was determined through the split-half method with the reliability coefficient of 0.89. The instrument administered on the subject. Two null hypotheses were tested at 0.05 level of significance. The data collected were analysed using inferential statistics of t-test. Based on the findings of the study, conclusion and appropriate recommendations were made.**

Keywords—Constructivist, Model, Instruction, Students' Academic Performance, Secondary Schools.

Introduction

Science education has in the past four decades had great expectations from educators and general public who continuously advocate for increased performance in scientific inventions and ability to apply and communicate scientific understandings which detailed falling standards in Nigeria's science education due to teachers using ineffective methods of teaching that do not promote high order thinking and creativity in youth.

Conventional methods of instruction marked by teacher lecturing dominate classroom practices (Amollo, 2005). Conventional methods of teaching though has been popular, has generated a lot of negative and positive thoughts. For instance, Keshta (2013), warns that conventional teaching often give pseudo impression that proper learning has occurred when students confirm comprehension of rote memorized material but hold many misconceptions about the same materials when tested at application levels of learning. Amollo (2005) also found conventional methods, particularly lecturing strategy to be characterised with; lack of planning, poor time management, unstructured presentation and content overload, less innovative and inconsistency in delivery resulting into students getting bored, and less motivated and so only few concepts are learned in a lesson.

The increasing negative effects of conventional teaching methods on quality of education and learner performance in science based subjects, it is necessary that the constructivist approaches be explored so as to find ways through which learner acquisition of knowledge and skills can be enhanced. In this period of time, Brown (2005) suggests that constructivist instruction methods should be promoted as the most relevant instructional method in classroom learning and be promoted by education policies and practices.

In the constructivist model, the students are urged to be actively involved in their own process of learning. The teacher functions more as a facilitator who coaches, mediates, prompts, and helps students develop and assess their understanding, and thereby their learning.

The constructivist physics teacher functions more as a facilitator who coaches, mediates, prompts, and help students to create and build meaning and knowledge. The critical goal is to wean the students away from dependence on instructors as primary sources of required information, helping them to become self-learners.

Using a constructivist perspective, teaching science becomes more like the science that scientists do it is an active, social process of making sense of experiences, as opposed to what we now call "school science." Indeed, actively engaging students in science (we have all heard the call for "hands-on, minds-on science .

Through the constructivist theory, when creating a curriculum, instructors allow students to engage in active, hands-on learning, use previous knowledge to expand on learning, and increase self-confidence along with problem-solving skills.

A productive, constructivist classroom, then, consists of learner-centered, active instruction. In such a classroom, the teacher provides students with experiences that allow them to hypothesize, predict, manipulate objects, pose questions, research, investigate, imagine, and invent. Spector et al. (2010) defines constructivist theory as; a way of knowledge creation by the learner based on the learner interaction with the environment. The learning theory focuses on strategies that promote interaction between individual and the environment thus making learning a reflective and meaningful process.

Enrolment and achievement of female students in science based subjects in post-secondary secondary school is another challenge facing Nigeria education sector. According to the Nigeria Education Sector Support Programme (2005 – 2010), relatively low number of females compared to males enroll and pursue further studies in science subjects and science related courses. The report further details that female students perform relatively dismally compared to boys in the science subjects.

Folasade & Akinyemi (2009) had concluded that constructivist learning technique is more efficient, Saran (2011) reported that low achiever students that learnt through constructivist approach had achieved significantly higher score as compared to their counterpart that learnt by traditional method for social science (Physics) subject. NCF-2005 has emphasized following constructivist approach in classroom so that students can construct their own knowledge and understand the concept at grass-root level. Ultimately their achievement will be enhancing.

Dewey in 1972 had espoused that learning results from cognitive dissonance rather than reinforcement of behaviour as proponents of behaviourist learning suggest.

When students encounter new learning tasks they have not met before, they are forced to adjust their understanding to accommodate the new experiences and are therefore involved in cognitive rather than behavioural response. It is therefore imperative that the instructional methods will determine the quality of instruction offered. When doing a project work, students get time to reflect on learning materials received earlier there by helping them to solve new learning tasks they encounter in the project.

Students‘ attitude towards sciences or methods of instruction in science classrooms can be a contributing factor on performance of sciences in higher institutions, found attitude of high school students towards learning Physics to be characterized by less motivation when teacher centered methods of teaching were used compared to when interactive methods were used. Constructivist method of instruction, as Brown (2005) suggests, is an example of interactive method of learning.

Due to the challenges facing the students as highlighted above, to improve learner achievement, the students should be enabled to learn and use high order thinking skills in order to be relevant in a fast technologically changing world. To achieve this, teachers should use instructional methods that provide opportunity for learners to involve in knowledge creation. Also, teachers should encourage preparation of instructional objectives and assessment procedures that reflect learning at high order thinking skills. The present study investigated the effect of constructivist instruction on learner achievement in Physics on students learning in different classroom categories as boys, girls and mixed sex classrooms.

According to Spector et al., (2010), Constructivist instructional approach provides learners with opportunity to construct knowledge rather than being recipients of inert learning and therefore resulting into better learning. Learners own the learning process, acquire knowledge, skills and understanding and also manage the knowledge and skills acquired. Acknowledging the poor performance of candidates in Physics in senior school certificate examinations, this study sought to determine the effects of constructivist and conventional instructional methods on learner achievement in Physics in some selected secondary schools Ekiti State, Nigeria.

Research Hypotheses

The following null hypotheses were generated for the study:

1. There is no significant difference in students’ performance in Physics between students who were instructed using constructivist model and conventional method

2. There is no significant difference in the performance in physics of boys and girls that were instructed using constructivist instruction models.

Literature Review

What is constructivism?

Constructivism is a synthesis of multiple theories diffused in to one form. It is the assimilation of both behaviorialist and cognitive ideals. The “constructivist stance maintains that learning is a process of constructing meaning; it is how people make sense of their experience” (Merriam & Caffarella, 2014).

Mvududu & Thiel-Burgess (2012) state that constructivism is widely touted as an approach to probe for children’s level of understanding and to show that that understanding can increase and change to higher level thinking. Thus, constructivism refers to how of learning and thinking. Constructivism describes the way students can make sense of the material and also how the materials can be taught effectively. With Constructivism as an educational

theory in mind, the teachers should consider what students know and allow their students to put their knowledge in to practice.

Constructivist view of learning

Due to complexities and diversity of perspectives on constructivism, Hoover (2013) introduces a common set of principles for these perspectives that can be operationalized. Hoover expressed two important notions which encompass the simple idea of constructed knowledge. The first notion is that learners construct new understandings using their current knowledge. In other words, the learners' prior knowledge influences their new knowledge.

The second notion is that learning is not passive. Instead learning is an active process in which learners negotiate their understanding in the light of what they experience in the new learning situation. If what learners encounter is not consistent with J SociSci, Lit & Lang., their current understanding, their current knowledge can change in order to accommodate new experience. Thus learners cannot be passive and they remain active throughout this process.

Bruner (2010) comments on negotiating the curriculum as Negotiating the curriculum means deliberately planning to invite students to contribute, and to modify, the educational program, so that they will have a real investment both in the learning journey and the outcomes. Negotiation also means making explicit, and then confronting, the constraints of the learning context and the non-negotiable requirements that apply.

Twomey-Fosnot (2013) defines constructivism according to four principles: (1) learning depends on what individuals already know, (2) new ideas occur as individuals adapt and change their old ideas, (3) learning involves inventing ideas rather than mechanically accumulating a series of facts, (4) meaningful learning occurs through rethinking old ideas and coming to new conclusions about new ideas which conflict with our old ideas.

In constructivism, learning is represented as a constructive process in which the learner is building an internal illustration of knowledge, a personal interpretation of experience. This representation is always open to modification, its structure and linkages forming the ground to which other knowledge structures are attached. Learning is then an active process in which experience has an important role in understanding and grasping the meaning. This view of knowledge does not necessarily reject the existence of the real world, instead it agrees that reality places constrains on the existing concepts, and contends that all individuals' knowledge of the world is the interpretations of their experiences. Furthermore, conceptual growth is the result of various perspectives and the simultaneous changing of individuals' internal representations in response to those perspectives as well as through their experience.

Christie (2005) point out that constructivism is a learning theory in which learning is both an active process and a personal representation of the world. In this theory, knowledge is constructed from the experience and is modified through different experiences. Problem solving and understanding are emphasized in this theory. Authentic tasks, experiences, collaboration, and assessment are among other important factors in this view of learning.

Piaget's constructivism which is based on his view of children's psychological development insists that discovery is the basis of his theory. Piaget argues that to understand means to discover or reconstruct by means of rediscovery. Piaget discusses that children go through stages in which they accept ideas they may later change or do not accept. Therefore, understanding is built up step by step through active participation and involvement and learners cannot be considered as passive in any of the steps or stages of development.

Contrary to Piaget, Bruner (2010) states that learning is a social process, whereby students construct new concepts and knowledge based on their current knowledge. In this view of constructivism, the student selects information, constructs hypotheses, and makes decisions, with the aim of integrating new experiences into his existing knowledge and experience. Bruner emphasizes the role of cognitive structures for providing meaning and organization of experiences and suggest learners to transcend the boundaries of the given information. For him, learner independence lies at the heart of effective education and he argues that this independence can be increased when the students try to discover new principles of their own.

Moreover, curriculum should be organized in a spiral manner so that students can build upon what they have already learned.

Constructivist view of teaching

Hoover (2013) argues that constructivism has important implications for teaching. First, teaching cannot be viewed as the transmission of knowledge form enlightened or known to unenlightened or unknown. Constructivist teachers are not monologue teachers who just teach completely new lessons. Rather constructivist teachers have the role of guides for the students and provide their students with opportunities to test the adequacy of their current understandings.

Second, constructivist teachers consider the prior knowledge of their learners and provide learning environments that exploit inconsistencies between learners' current knowledge and their new experiences. The difference J SociSci, Lit & Lang., between learners challenges the teachers and does not allow them to use the same method or the same materials while teaching to these students.

Third, since learners' involvement is emphasized in the constructivism, the teachers must engage students in learning, and bring their students' current understanding to the forefront. Constructivist teachers can ensure that learning experiences include problems that are important to the students, and are not just related to the needs and interests of teachers and the educational system.

Fourth, Hoover (2013) reminds that sufficient time is needed to build the new knowledge actively. During this time, the students reflect on their new experiences and try to consider the relationship between these experiences and the previous ones in order to have an improved (not "correct") view of the world.

Similar to the effect of negotiation as an important aspect of a constructivist classroom on learning, negotiation also unites teachers and students in a common purpose. Smith (2003) confirms that negotiating curriculum means "custom-building classes every day to fit the individuals who attend.

Constructivist view of the learner

Constructivism believes that learner's conceptions of knowledge are derived from a meaning-making search in which learners construct individual interpretations of their experiences. The learners' constructions during the examination, questioning and analyzing of tasks and experiences yield knowledge whose correspondence to external reality may have little verisimilitude. However, most of the learners' constructions is filtered through a process of social negotiation or distributed cognition.

Giroux (2013) notes that teachers are often trained to use various models of teaching and evaluation, yet are not taught to be critical of the assumptions that underlie these models. He advises that teachers must be more than technicians but transformative intellectuals engaging in a critical dialogue among them.

Akanwa & Ovute (2014) studied the Effect of Constructivist Teaching Model on SSS Physics Students' Achievement and Interest. The study revealed that: (1) physics students taught with the constructivist model have higher interest toward physics that those taught physics using the conventional teaching approach. (2) there is a significant difference between the interest of the constructivist group and those of the conventional model group at $P < .05$ level of significance in favour of the constructivist group. Similarly, Ogundola et. al (2010) carried out a study on Effects of Constructivist Instructional Approach on Teaching Practical Skills to Mechanical Related Trade Students in Western Nigeria Technical Colleges. Result from the study revealed that: (1) Students taught with constructivism instructional approach scored higher in the post-test than those taught with conventional method. According to the researchers, this signifies that the components of constructivism instructional approach such as concept mapping, cooperative work skills and cognitive apprenticeship lead to higher academic achievement in general metal work than the conventional method. (2) There was no significant difference in the mean scores of male and female students taught with the constructivism instructional approach.

Studies on Gender and Academic Achievement

Owodunni & Ogundola (2013) investigated Gender Differences in the Achievement and Retention of Nigeria Students Exposed to Concept in Electronic Works Trade through Reflective Inquiry Instructional Technique. The findings of the study revealed that: (1) the mean score of boys was higher than the mean score of girls taught Electronic works trade using reflective inquiry instructional technique, (2) the mean score of girls was higher than that of the boys in the test for retention of learning.

Similarly, Aina & Akintunde (2013) carried out a study titled Analysis of Gender Performance in Physics in Colleges of Education, Nigeria. The results showed that students' performance in physics in Colleges of Education is not gender bias; however, male students are better in performance than female students. Aina & Akintunde (2013)'s study is related to the present study in that they both examine gender and academic achievement. The study is different from the current study in the sense that it adopted survey research design.

Methodology

This study used quasi-experimental design. The experimental study employed pre-test and post-test treatment. The experiment and control study are located at different places consisting of male and female students in some selected public secondary schools Ekiti State.

The sample for the study was 60 Senior Secondary Two (SSII) Physics students (this sample was divided into the experimental and control groups in ratio 1: 1 i.e. 30 in each group), selected through purposive random sampling technique from a total population of 87 SS II students offering Physics in all the 10 public Senior Secondary Schools in Ekiti local government Area, Ekiti State. The experimental group comprises of 18 males and 12 female SSII students.

The instrument used to collect relevant data from the subjects was Physics Achievement test (PAT). The instrument was subjected to validity and reliability mechanism. The reliability of the instrument was determined through the split-half method with the reliability coefficient of 0.89.

The administration of the instrument was in three stages: the pre-treatment stage (two weeks), the treatment stage (four weeks) and the post-treatment stage (two weeks). Eight weeks altogether were used for the whole study. The experimental group was treated with out-door instructional package (i.e. the students were taught outside the classroom with the

package) while, the control group were taught with the same concepts but through the conventional teaching approach.

Two null hypotheses were tested at 0.05 level of significance. The data collected were analysed using inferential statistics of t-test.

Results and Discussion

The study was designed to analyze the effects of constructivist and conventional instructional methods on learner achievement in Physics in some selected secondary schools in Ekiti State.

Hypothesis 1

There is no significant difference in students' performance in Physics between students who were instructed using constructivist model and conventional method.

Table 1*:* t-test analysis of students' performance in Physics between students who were instructed using constructivist model and conventional method.

Variables	N	Mean	SD	df	t_{cal}	t_{tab}	Decision
constructivist model	30	32.46	6.43	58	7.17	1.98	S
conventional method	30	22.36	4.26				

p< 0.05 level of significance. S = Significant

As shown in Table 1, t-cal (7.17) is greater than t-tab (1.98). The null hypothesis is therefore rejected, which mean there is significant difference in students' performance in Physics between students who were instructed using constructivist model and conventional method.

Hypothesis 2

There is no significant difference in the performance in physics of boys and girls that were instructed using constructivist instruction models.

Table 2*:* t-test analysis of students' performance in Physics of boys and girls that were instructed using constructivist instruction models.

Variables	N	Mean	SD	df	t_{cal}	t_{tab}	Decision
Boys	18	17.12	5.11	28	0.08	1.98	NS
Girls	12	16.98	4.68				

P > 0.05 level. NS = Significant

As shown in Table 2, t-cal (0.08) less than t-tab (1.98). The null hypothesis is therefore accepted, which mean there was no significant difference in the performance in Physics of boys and girls that were instructed using constructivist instruction models.

Discussion

On the basis of a critical observation made on the data collected for the research work, certain facts are borne out and made more evident. It has become established from the data obtained and analyzed that significant relationship exist between the achievement of physics students exposed to constructivist and those exposed conventional instructional methods. This implies that constructivist application played a significant role in academic achievement. Despite the fact that it has capacity of making or allowing students to exhibit further studies, it is still efficient and effective in teaching and learning of physics. It suffices to say that constructivist is a viable and beneficial tool in secondary schools and higher education. The finding agrees with the findings of Akanwa & Ovute (2014) on the study titled: "Effect of Constructivist Teaching Model on SSS Physics Students' Achievement and Interest". The study revealed that: (1) physics students taught with the constructivist model have higher interest toward physics that those taught physics using the conventional teaching approach. (2) there is a significant difference between the interest of the constructivist group and those of the conventional model group at P < .05 level of significance in favour of the constructivist group.

The finding of this study also reveals that there was no significant difference in the performance in Physics of boys and girls that were instructed using constructivist instruction models. The finding agrees with the findings of Aina & Akintunde (2013) on the study titled "Analysis of Gender Performance in Physics in Colleges of Education, Nigeria:. The results showed that students' performance in physics in Colleges of Education is not gender bias.

Conclusion

Constructivist model should be used in conjunction with conventional strategy in teaching and learning processes to boast student's achievement. Teachers should serve as primary motivators for students to participate and communicate via constructivist model for educational purposes. Since students prefer personal readings, for educational and communication purposes in academia, they should continue to be used.

Recommendations

From the findings of the study, it is recommended that:

(i). Constructivist should be used in conjunction with conventional strategy in teaching and

learning processes to boast student's achievement.

(ii). Teachers should encourage the usage of constructivist model in teaching and learning

processes to acquire the requisite knowledge and skills in integrating the technology.

(iii). Students should be involved in using Constructivist in learning activities such as doing

assignments for learning resources because it is believed that constructivist model can

enhance lecturer and student personal studies, also tends to increase students learning

motivations.

(iv). Curriculum developers/ designers should incorporate the constructivist model such like

Constructivist into curriculum.

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