

**PRAXIS OF CONSTRUCTIVIST LEARNING THEORY ON LEARNERS
ACHIEVEMENT IN SECONDARY SCHOOL SCIENCE SUBJECTS IN KENYA**

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Constructivism is a philosophical stance on human knowledge that argues that human beings generate knowledge and meaning from an interaction between their experiences and their ideas (Alawiye, 2003). Odundo and Gunga (2013) observed that constructivism is a cognition theory that stimulates an individual learner to process stimuli from the environment and the resultant cognitive structures that allows the learner to build and produce adaptive behaviour. According to Mwanda (2016) the prominence of science education in the recent past has attracted great expectations from the teachers and general public who continuously advocate for increased performance in scientific inventions and the ability to apply and communicate scientific understandings. However, Poor performance of students in science subjects as a result of poor instructional strategies has been a major hindrance to the acquisition of scientific knowledge in Kenyan secondary schools.

Studies by Ambogo (2012) indicated that the problem of poor performance in science subjects is a global phenomenon. In the United States for example, most of the students perform poorly in science subjects as compared to the humanities. This problem prompted the US National Academy of Sciences in 1996 to establish the National Science Education Standards to help in assessing the viability of the constructivism theory and utility of science-

based inquiring in teaching of science subjects. The standards recommended for more than 'science as a process', in which students learn skills as observing, experimenting and inferring. Also, the standards advocated strongly for inquiry as a central tool to science learning. Here, students describe events, objects, ask questions, construct and test their explanations against current scientific knowledge and communicate their ideas to others.

The problem is made worse in African countries due to the existing digital divide and inadequate resources that has led to the adoption of poor teaching approaches. In Nigeria for instance, there has been a growing public anxiety about the teaching and learning of science in secondary schools. Studies by Salau (1996) showed that large numbers of students seem to learn very little science due to rote learning and thus making students to find difficulties to excel in science subjects.

Conversely, a comparative study by Adeyemi (1990) found out that Nigerian students perform poor in science subjects relative to their counterparts in other African countries. This is evident from the Second International Science Study in which Nigerian Students came second to last in secondary science and last in primary science among the participating countries of the world.

In Kenyan situation, Mwanda (2016) observed that the use of conventional methods of instruction marked by teacher lecturing dominate classroom practices. Despite the various interventions made by the government to improve the situation which include, building and renovating laboratories, and recruitment of more teachers, supplying equipment, introducing computer science and ICT skills in learning and establishment of Teacher Resources Centers (Mutambuki, 2014). The scorecard in these key disciplines has persistently made a depressing reading despite the massive investment. Awuor (2013) attributes the poor performance to poor teaching strategies whereby teachers do not actively involve students in the teaching and learning process. A study by Mutambuki (2014) indicates that most of the teachers of science

regularly utilize lecture method in teaching with little room for discussions and discovery methods.

Keshta (2013) has blamed the conventional teaching strategies for poor performance in science subjects since they give teachers a pseudo impression that proper learning has occurred when learners confirm understanding of rote memorized material but hold many misconceptions about the same materials when tested at application levels of learning. Also, Mwanda (2016) opined that conventional teaching strategies make teaching and learning process boring and less motivating to learners since they are characterized by inadequate planning, unstructured presentation, poor time management, content overload and inconsistency in content delivery.

Lamauskas (2012) proposes the application of constructivist approach in teaching of science subjects in Kenyan secondary schools so as to enhance the acquisition of scientific knowledge. Proponents of constructivists believe that knowledge is generated by learners through experience-based activities rather than direct instructions from the teachers. Additionally, Odundo and Gunga (2013) reiterate that it is essential for teachers of science subjects to provide learner with opportunities to uncover facts and discover ideas in either a real world setting or case-based environment through own efforts in a regulated manner. Cummings (2007) also found out that where constructivist approaches are employed during cognition, learners post an improvement in their academic performance, especially science subjects.

According to Lamauskas (2012), Constructivist philosophy does not dictate how one should teach; however, it does make it incumbent upon the teacher to deal with each learner as an individual, to value diversity of perspective, and to recognize that the learner's behaviour is a direct reflection of their life experiences. Bandura (1977, 1986, 1995, 1997), Fullan (1993), and other self-efficacy researchers have concluded that the catalysts for reforms in teaching of

science is the ability of the individual teacher to stimulate cognition through provision of an environment that empowers the student to construct knowledge.

Disparity in enrolment and academic achievement of female students in science based subjects in both secondary and post-secondary institutions is another crisis facing the Kenyan education sector. A study by Kenya Education Sector Support Program (2005-2010) as cited in Mwanda (2016) show that a relatively low number of female students compared to males pursue science related course in post-secondary institutions. Additionally, the study indicated that female students perform fairly poor in science subjects in Kenya National examinations as compared to male students. For instance, an analysis's by Kenya National Examination Council (2008) showed that male students registered a percentage Mean score of (M=32.01) while female students registered an overall mean score of (M=29.08). KNEC (2008) attributes the discrepancy in the performance of science subjects to poor instructional methods. Besides poor instructional strategies, some of the factors that lead to poor performance of girls in science subjects include religion, culture and attitude of female students towards the science subjects.

Constructivism is an essential teaching strategy since it empowers the cognitive processes of the learners rather than behavioral responses that are championed by conventional teaching strategies. When learners interact with new experiences they have not met before, they are forced to adjust their understanding to accommodate the new learning tasks a fact that makes the learning process more interactive and enjoyable (Mwanda, 2016). Miheso-O'Connor, (2002) reiterates that the use of interactive teaching techniques like group discussions is a powerful tool that can help to alleviate disparity in learning achievement of science subjects between boys and girls. This is because the learners are involved in both individual and group reflection of their learning experiences.

Statement of the problem

Academic achievement in science subjects in Kenyan secondary schools has been on the decline in the recent past. This is attributed to poor instructional strategies like lecture method and use of few demonstrations. The conventional teaching techniques expose learners to minimal group discussions, field trips and practical activities. Low academic achievement in science subjects call for consideration of constructivism method as a primary technique of instruction while teaching science subjects. This is because the teaching approach gives students an opportunity to construct their own knowledge after interaction with the environment rather than being recipients of knowledge thus stimulating cognition. Also, Constructivism approach is critical in liberalizing the process of learning since it gives student the autonomy to not only own the learning process but also managed the knowledge and skill they acquired from the environment. The study will seek to examine the effect of constructivist approach on academic achievement of science subjects in secondary schools in Kenya.

Objectives of the study

- (i) To examine the effect of constructivism on learners achievement in science subjects in Kenya.
- (ii) To determine the effectiveness of constructivist instruction on academic achievement of boys and girls in science subjects.
- (iii) To evaluate the effect of constructivist and conventional approaches on academic achievement of science subjects.
- (iv) To establish the effect of constructivism on the attitude of boys and girls on science subjects.

Hypothesis

- (i) There is no significant the effect of constructivism on learners' achievement in science subjects in Kenya.

- (ii) There is no significant effectiveness of constructivist instruction on academic achievement of boys and girls in science subjects.
- (iii) There is no significant effect of constructivism and conventional instructional approaches on academic achievement of science subjects.
- (iv) There is no significant effect of constructivism on the attitude of boys and girls on science subjects.

Purpose of the study

The purpose of the study is to explore the impact of constructivist learning activities on enhancing the performance of science subjects in Kenyan secondary schools.

Significance of the study

This research is of great significance to teachers of science since it will improve their instructional strategies on teaching of science subjects. This is because the study will help to enhance the ability of teachers to adopt inquiry and reflective teaching through the adoption of instructional activities like experimental learning, reflection, self-observation, field work, hybrid learning and evaluation.

Similarly, the study will improve the ability of science teachers in creating a favorable learning environment that encourages constructivist learning to flourish. Constructivism is so important in teaching of science since it provides conducive environment for conceptual change, promoting self-regulating learners and improving academic achievement in science subjects. Also, the study is critical in equipping science teachers with the methodologies on how to involve learners in making meaning out of interactions with the environment hence making the learners to own the learning process.

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