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Evaluation of Sustainable Development Goal 4 on Basic Science and Pupils' Academic Achievement in Sokoto State, Nigeria

Abdullahi Adamu
Department of Quality Assurance,
Sokoto State Universal Basic Education Board

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Abstract

This study is on evaluation of sustainable development goal 4 on pupils' academic achievement in basic science in Sokoto State, Nigeria. It is a descriptive study in which a survey research design is employed. One research question and one null hypothesis was stated and analyzed. The sample pupils for this study were 256. There instruments used to collect data for the study is Basic Science Examination Questionnaire (BSEQ). The research question was answered using means and standard deviations while the hypothesis was tested using t-test at $p \leq 0.05$ level of significance. The result revealed a significant difference between the mean Basic Science achievement scores of pupils taught by teachers trained under SDG and that of pupils taught by teachers not trained under SDG in Sokoto State. It was therefore recommended that professional bodies such as Science Teachers Association of Nigeria (STAN) and NGO's should focus on assessment of pedagogical skills as well as follow up evaluation procedure for on the spot observation of teachers' competence.

Keywords*: Sustainable Development Goal, Basic Science, Academic Achievement*

Corresponding Author: **Abdullahi Adamu**

Background to the Study

Sustainable Development Goals (SDGs) are adopted to replace Millennium Development Goals (MDGs) when it became apparent that attainment of MDGs goals in 2015 was not possible. Just like MDGs that had a life span of 15 years (2001 to 2015), these present SDGs is from 2016 to 2030. The project was designed in such a way to continue with unfinished business of the MDGs and direct attention on the core values of sustainability, universality and inclusiveness (United Nation, 2015a). Specifically, goal 4 of the SDGs targeted education and it seek to ensure inclusive and equitable quality education and promote lifelong learning opportunity for all. In all, goal 4 has ten targets which each nation including Nigeria is to meet by 2030. Academic achievement of pupils in the basic science has implications for the attainment of the goal 4 of Sustainable Development Goals (SDGs). Okeshola (2010), maintained that attaining the SDGs of eradicating poverty and hunger, promoting gender equality and the empowerment of women, reducing child mortality, improving maternal health, combating HIV/AIDS and ensuring environmental sustainability are predicated on sound education. Okeshola (2010), further posited that the acquisition and dissemination of the requisite knowledge and skills and their effective application to address challenges that cumulatively result in sustainable development are highly dependent on a strong education system.

It is not possible to discuss the strategies for achieving the Sustainable Development Goals (SDGs) without making reference to the teachers since they play pivotal role in advancing goals of educational systems. A plethora of literature articulates clearly how teachers are the key factors that drive the education system which help in developing the requisite manpower for accelerating national development. Since teachers are at the heart of the transformation, to do this effectively, they need to be adequately equipped. Thus, the teacher becomes a major factor in the strategies for achieving the targets of the SDGs. Indeed, it all starts with the teacher, but is it any caliber of a teacher? Undeniably, without a professionally qualified and committed teacher, schools can hardly achieve their primary purpose of facilitating student meaningful learning in learners.

As a matter of fact, teachers whose orientation are highly skewed towards teaching children to pass examinations and who do not utilize the teachers' Pedagogical Skills cannot positively impact on SDG 4 and consequently on the other 16 SDGs. In other words, a teacher education curriculum that emphasizes the development of cognitive competences will definitely be inadequate, as a more critical, expansive orientation to knowledge and technological pedagogical skills is required, if equitable, quality education is to be achieved.

The implication is that teacher education programmes must support teacher trainees with these soft skills as well as technological pedagogical skills to effectively equip learners for sustainable development. Unfortunately, UNESCO (2015, 2016) found that around 250 million children are not learning basic skills, even though half of them have spent at least four years in school. Affirming this deficiency in teachers, Rose and Alcott (2015), said teachers are unable to perform numeracy and literacy tasks for which they are meant to be preparing their students. To fill this gap, Rose and Alcott (2015), called for appropriate training incorporating

practical classroom experience, which will enable teachers support children to learn the basic skills and to progress at the right pace**.** It thus implies that if teachers in government schools often lack the proficiency to do their work, government cannot deliver inclusive, equitable quality education, if it does not improve on the capacity of teachers in all the levels of the education system. Considering the fact that teachers tend to teach as they were taught, the need to institutionalize in-service training that equips teachers with reflective practice and peer collaboration becomes an imperative so that these new skills germane to the SDGs will be acquired, which will result into good academic achievement of pupils.

Achievement as concept has been defined in different ways by different educationists depending on the situation at hand. Broadly speaking, achievement simply means accomplishment or proficiency of performance in a given task or body of knowledge. Academic achievement is the knowledge attained or skill developed in the school subject, in most cases designated by test score or by means assigned by teacher (David and Stanley, 2000). Pupil's Academic Achievement could be broadly categorized into two, achieve or under achieve. Under achieve is regarded as performance that is below minimum standard (Okebukola and Jegede, 1986). Under achievement according to Abbas (2009), is a level of achievement below expected intelligent quotient (IQ) of an individual. It means shortfall bellow expected level of attainment as predicted by the students known or measured intellectual ability and actual performance.

Also, Okebukola and Jegede (1986), subdivided pupil's achievement into three categories: High achiever (Top 75%), Medium achiever (Middle 55%) and Low achiever (Bottom 25%). Pupils' academic achievement according to Musa (2000) refers to the quality of result produced by students as reflected in the quality of their examination scores. Studies revealed that teachers' skills is positively associated with pupils' academic achievement (Konig, Blomeke, Paine, Schmidt and Hsieh, 2011), whereas other studies show no predictive value of teacher on the variance of teacher effects. The effect of teacher skills found to be positive by some researchers. Other studies suggest that the teachers may affect pupils' academic achievement, given that specialization would require teachers to take a large proportion of courses within a particular subject area (Cochran-Smith and Lytle, 1999; Konig, Blomeke, Paine, Schmidt and Hsieh, 2011).

Furthermore, more experienced teachers are considered to be more also able to concentrate on the most appropriate way to teach particular topic in basic science to pupil who offer in their ability's prior knowledge. Santillan (2008), was of the view in order to improve on any aspect of education it is therefore imperative involve a well-articulated teacher education programme that will prepare the teacher for the leadership role they are expected to play. Studies have found that the effect of teachers' skills on pupils' academic achievement outcomes is positive and significant in some cases (Santillan, 2008). Another important measure of teacher effectiveness, teachers' pedagogical content knowledge, has been found to positively impact pupils' academic achievement (Shavelson and Stern, 2001), though it is difficult to dissociate pure content knowledge from the pedagogical aspects of teachers' characteristic. While existing studies offer insight into the importance of some teacher characteristics, studies that specifically examine the effect of teacher Pedagogical Skills on pupils' academic achievement are too scarce.

Theoretical Framework

The theoretical framework for this study is based on Skinner's Operant Conditioning. Operant Conditioning has been defined by Zimbardo and Buch (1980), as the process by which behavior can be modified or controlled through environmental manipulations. Skinner (1938), improved on the work of Thorndike and looked at learning as contingent upon conditions within the learner and conditions outside the learner, which can be manipulated in the learning situations. He argues that any human behaviour can be understood on the basis of learning to synthesized (train) that behaviour from scratch, and how to predict and control that behaviour. He therefore emphasizes the use of functional analysis in understanding behaviour. This involves identifying and isolating the environmental variables of which the behaviour is a lawful function. He arrived at this conclusion from his "Skinner box" experiment.

Skinner (1938), also pointed out that to reinforce a particular behaviour so that it will occur much more often than at present we have to resort to shaping and modeling. Shaping consist of reinforcing behaviours that gradually approximated the desired behaviour in which in this study is SDG training programme. Modeling refers to form of behaviour therapy techniques aimed at changing an individual's behaviour by setting standard behaviour, which the individual will learn, by imitating through perceptual means (Skinner, 1938). The force behind this technique is perceptual learning – imitating a model or observation technique. Observing other models is a principal way in which human learn, watching people who are displaying appropriate and adaptive behaviour should teach people with maladaptive response better coping strategies such as SDG training programme. The model may be observed live or video tape. Modeling is very effective both to eliminate unwanted behaviours and to build new behavioural competencies. Hence the reason for adopting Skinner's operant conditioning for this study. Therefore, this study will evaluate whether SDGs 4 and pupils' academic performance in basic science.

Statement of the Problem

Despite the fact that professional teachers have undergone NCE and undergraduate programme in education to enable them adequately prepare for the teaching of basic science, still there is persistent failure in Basic Education Certificate Examination (BECE), MOE Sokoto (2017). The problems identified for this include low morale and poor preparation of teachers, overcrowded classroom/inadequacy of laboratory and workshop facilities, poor attitude of students to work, gross under-funding and inadequacy of rewards for excellence in science teaching and learning among others. Similarly, studies conducted by various researchers such as Akbani and Allvar (2010), Jekayinfa (2007), Usman (2007 and 2010) and that of Igboegwu (2012), indicated that the problem of teaching and learning Basic Science particularly at Junior Secondary School level persist despite various strategies employed to address the challenges. One of the mechanisms put in place to ameliorate the situation is the training and re-training of teachers under SDG programme aimed at improving teachers' skills and capacity to effectively deliver in classroom teaching situations. However, In spite of the efforts of government and other concern stakeholders towards reviving the teaching and learning of Basic Science through SDG training programs to Basic Science teachers, pupils' performance in Basic Science is still not encouraging. Therefore, this study is instituted to evaluate SDG 4 on Basic Science and pupils' achievement in Sokoto state, Nigeria.

Objective of the Study
The objective of the study was to assess Basic Science achievement of pupils taught by teachers trained under Sustainable Development Goals (SDG) 4 in Sokoto State.

Research Question
The research question raised to guide the study was:
What is the difference between the mean Basic Science achievement scores of pupils taught by teachers trained under Sustainable Development Goals (SDG) 4 and those not trained under SDG 4 in Sokoto State; and

Research Hypothesis
The null hypothesis tested at $p \leq 0.05$ level of significance was:
There is no significant difference between pupils taught by trained and untrained basic science teachers with regards to their mean achievement score in basic science in Sokoto State.

Methodology
Research Design
This study was set to evaluate the Sustainable Development Goal (SDG) 4 on basic science and pupils' academic achievement in Basic Science in Sokoto State, Nigeria. The study employed a survey research method in which treatment by subject design was used. This enabled the researcher to obtain JS II students' academic achievement in Basic Science. The researcher selected the basic schools whose Basic Science teachers had SDG training and no SDG training. The researcher visited the selected schools personally in order to administer the questionnaire and collect the result within four weeks.

Population of the Study
The population for this study made up of all the 54,612 JSS II pupils in the 222 Upper Basic schools in the state.

Sample and Sampling Procedures
The sample pupils for this study were 256 pupils. The pupils were selected according to the Cochran's formula and table of sample size determination. In order to have basis for fair analysis of the data to be collected, purposive sampling technique was used to select two schools each from the four Education Zones. In each of the selected schools, a single class was randomly selected to participate in the research.

Instrumentation
The Basic Science Examination Questionnaire was the instrument used to collect data for the study. The instrument contains 20 items with 4 options from where the student picks the correct answers to each question. Each correct answer attracts 5 marks while wrong answer attracts 0 (zero) mark. The maximum score is 100, the mid score is 50, however, students can also score zero (0) mark.

Validation of the Instruments

All the items on the instrument were past questions from BECE in Basic Science. The questions were based on curriculum of JSS II. The instrument was given to Basic Science teacher to validate, and they adjudged the instrument to have content, construct and face validity.

Reliability of the Instruments

The reliability of an instrument is the capability of the instrument to measure what it is supposed to measure. The reliability measure is part of the quantitative procedure of validating an instrument. The instrument reliability indices were computed using split-half method employing odd and even number procedure by employing Cronbach's alpha statistical tool to compute the alpha coefficient. The reliability coefficient "r" = 0.86 was obtained which signified that the instrument was reliable.

Data Analysis

Descriptive and inferential statistics were used in the data analysis procedures. The research question was analyzed using descriptive statistics of means and standard deviations. The hypothesis, on the other hand, was tested t-test statistics tool at $p \leq 0.05$ level of significance.

Results

Data from Achievement Test

Table 1: Mean Basic Science achievement scores of pupils taught by teachers trained under SDG and those not trained under SDG

Training	N	Mean	SD	Mean Difference
Trained	152	66.56	20.625	18.793
Untrained	104	47.77	19.786	
Total	**256**			

The result shows the mean Basic Science achievement scores of pupils taught by teachers trained under SDG and those not trained under SDG. The mean achievement scores of pupils taught Basic Science by teachers trained under SDG (M=66.56, SD=20.625) was higher than that of pupils taught by teachers that did not receive any training under SDG (M=47.77, SD=19.786). The mean difference was 18.793 in favour of pupils taught by teachers trained under SDG. Therefore, difference between the mean Basic Science achievement scores of pupils taught by teachers trained under SDG and those not trained under SDG in Sokoto State is large.

Table 2: Summary of Independent Samples t-test on Basic Science Achievement Scores of Pupils Taught by Teachers Trained and Not Trained Under SDG

Training	N	Mean	SD	Mean Difference	t	df	P	Remark
Trained	152	66.56	20.625	18.793	7.279	254	.001	S
Untrained	104	47.77	19.786					
Total	**256**							

***Significant at p=0.05**

The table 2 presents the mean Basic Science achievement scores of pupils taught by teachers trained under SDG and those not trained under SDG. The mean achievement scores of pupils taught Basic Science by teachers trained under SDG (M=66.56, SD=20.625) is higher than that of pupils taught by teachers that did not receive any training under SDG (M=47.77, SD=19.786). The mean difference is 18.793 in favour of pupils taught by teachers trained under SDG. The difference is in favour of trained teachers based on mean score (66.56) recorded as indicated in Table 1. This is supported by t(254)=7.279, p=0.001. The null hypothesis which states no significant difference is rejected. Therefore, there is a significant difference between the mean Basic Science achievement scores of pupils taught by teachers trained under SDG and that of pupils taught by teachers not trained under SDG in Sokoto State. That is, pupils that were taught Basic Science by teachers that received SDG training performed better than those taught by teachers that did not receive any SDG training in Sokoto State.

Discussion

The result of the hypothesis tested revealed that there is significant difference between the mean Basic Science achievement scores of pupils taught by teachers trained under SDG and those not trained under SDG in Sokoto State. The result shows improvement in academic achievement of pupils taught Basic Science by teachers trained under SDG in Sokoto State. This may not be unconnected with the cooperative nature embedded in the pedagogical skills used to teach the experimental group. The result is corroborated with the studies of Konig, Blomeke, Paine, Schmidt and Hsieh (2011), whose study revealed that teacher's skills is positively associated with pupils' academic achievement. Likewise, Santillan (2008), was of the view that in order to improve on any aspect of education it is therefore imperative to involve a well-articulated teacher education programme that will prepare the teacher for the leadership role they are expected to play. Furthermore, experienced teachers are considered to concentrate on the most appropriate way to teach particular topic in basic science to pupil who offer in their ability's prior knowledge.

Conclusion

Deducing from the outcome of the study, it could be concluded that SDGs teachers retraining programme is an important exercise for pupil academic achievement in Basic Science as pupils' achievement in Basic Science improved due to the SDG training given to the Basic Science teachers.

Recommendation

Based on the finding of the study it is recommended that professional bodies such as Science Teachers Association of Nigeria (STAN) and NGOs should focus on assessment of pedagogical skills as well as follow up evaluation procedure for on the spot observation of teachers' competence.

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