



Evaluation of Sustainable Development Goal 4 Teacher Training on Basic Science Teachers' Pedagogical Skills in Sokoto State, Nigeria

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ABSTRACT

This study examined the impact of Sustainable Development Goal 4 Teacher Training on Basic Science teachers', pedagogical skills in Sokoto State, Nigeria. It was a descriptive study in which a survey research design was employed. The population for this study made up of all the Basic Science teachers in Upper Basic level in Sokoto State. There were 222 Upper Basic level schools in Sokoto state with a population of 241 Basic Science teachers. The sample of teachers used in this study included 51 SDG trained teachers and 56 non-SDG trained teachers. The sample pupils for this study are 256 with 105 males and 151 females. There are two types of data collected in this study; primary and secondary data. One research question and one null hypothesis are stated and analyzed. The research question is answered using descriptive statistics of means and standard deviations. The null hypotheses, on the other hand, are tested using parametric and non-parametric statistics at a $P \leq 0.05$ level of significance. There are two instruments used for the study; Basic Science Teachers Pedagogical Skills and Attitude Questionnaire (BSTPSAQ) and Eggleston Basic Science Teacher Observation Schedule (EBSTOS). The BSTPSAQ and EBSTOS instruments were validated and pilot tested once to ascertain the construct, content, and criterion-related validity. Using the split-half method employing odd and even number procedures, the internal consistency of the items for the BSTPSAQ instrument was found to be 0.87. The EBSTOS was administered on 6 teachers who were assessed twice each and the reliability index was computed using Kuder-Richardson KR-20 and the reliability coefficient "r" was 0.79. The finding of the study showed a significant difference between the mean score in Basic Science pedagogical skills; under SDG and those not trained under SDG in Sokoto State. From the findings of the study, the following recommendation among others is made, Teachers' professional development should be part of the prerequisite for employability of all teachers.

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INTRODUCTION

Integrated Science, as a foundation science course, should be properly taught at the primary and junior secondary schools to achieve the aforementioned objectives (Bajah, 1978, 1983). Therefore, Integrated Science, to this end, should be introduced to a learner with care and

accuracy to teach what science is all about and how scientists work. Children at this stage are curious, inquisitive, and flexible along with appropriate methods and activities for the child's active participation.

According to Obiekwe (2008) and Oludipe (2011), the teaching of science in Nigeria



Junior Secondary Schools falls shorts of the standard expected of it. Most of the teaching methods used had been described as inappropriate and teacher-centred (Ibe & Madu, (2004); Shaleigh, (2004); Igboegwu, (2012). These methods of teaching included drill, lecture, diagnosis, direct observation, field trip, group work, manipulation, modelling, reading, and recitation. In addition to that various studies by Jekayinfa (2007) and Usman (2007 & 2008) have indicated that some teachers of Basic science were not qualified and this, in turn, affects students' academic performance. One critical problem of teachers is that of the inability to use appropriate activity-based teaching methods.

In its effort and commitment to improve and enhance quality teaching of Basic Science at Junior Secondary School to arrest persistent students' failure in Basic Education Certificate Examination (BECE), the Federal Government of Nigeria through the support of different international development partners came up with different training and re-training of teachers at the basic education level. Some of the initiatives included a nationwide-capacity building programme for all primary school teachers under the former Millennium Development Goals (MDG) Project.

When it became clear and apparent that it was not possible to attain Millennium Development Goals (MDGs) at the end of December 2015, the terminal date for the project. The United Nations general assembly met in New York, precisely on the 25th of September, 2015, and adopted 17 goals, 169 targets with the motto "leave no one behind". According to the FME/NTI, 2016 Sustainable Development Goals (SDGs) are a detailed far-reaching, and people-centred set of universal goals and targets. According to Azare (2016), the Sustainable Development Goals (SDGs) are a detailed people-oriented set of Universal goals and targets, with the motto "Leave No One Behind". The SDGs replaced the Millennium Development Goals (MDGs), which expired on the 31st of December 2015. Just like MDGs that had a lifespan of fifteen years, that is (2001 to 2015). The newly inaugurated SDGs will last from 2016 to 2030. The project will continue with the unfinished business of the former MDGs and give attention to the core value of

sustainability and universality, and inclusiveness. Having spent the period under review e SDGs' implementation needs to be evaluated.

Evaluation can be [formative](#) that is taking place during the development of a concept or proposal, project or organization, to improve the value or effectiveness of the proposal, project, or organization. It can also be [summative](#), drawing lessons from a completed action or project or an organization at a later point in time or circumstance (Arends, 2012). However, in this study formative evaluation which is an aspect of follow-up evaluation will be employed to assess Sustainable Development Goal 4 on Basic Science teachers' pedagogical skills in Basic Science in Sokoto State, Nigeria. This is because the SDGs project commenced in 2016. Therefore, in this study formative type of evaluation will be employed to evaluate SDG 4 on basic teachers' pedagogical skills, in basic science in Sokoto State.

Theoretical Framework

The theoretical framework for this study is based on Skinner's Operant Conditioning Theory. Skinner (1953) proposed a form of behaviour, which arose out of the observations of animal performance. The force behind this technique is perceptual learning – imitating a model or observation technique. Observing other models is a principal way in which humans learn, watching people who are displaying appropriate and adaptive behaviour should teach people with maladaptive responses better coping strategies such as SDG training programmes. Therefore, this study will evaluate whether the SDG training programme influences teachers' attitude pedagogical skills, and pupils' academic performance in Basic Science.

Studies conducted by various researchers such as Akbani and Allvar (2010), Jekayenfa (2007), Usman (2007 & 2010), and that of Igboegwu (2012) indicated that the problem of teaching and learning Basic Science particularly at the Junior Secondary School level persist despite various strategies employed to address the challenges. One of the mechanisms put in place is the training and re-training of teachers under the SDG programme aimed at improving their skills and capacity to effectively deliver in classroom



teaching situations. This, therefore, calls for concern among the stakeholder in education especially the government and parents who are the major shareholders in children's education. Therefore, this study evaluated Sustainable Development Goal 4 on basic science teachers' pedagogical skills in basic science in Sokoto State, Nigeria.

REVIEW OF LITERATURE

The pedagogical skills that teachers should imbibe include but are not limited to Classroom Management, Teaching Methods, Classroom assessment, Structuring of learning objectives, Lesson process, Lesson planning, Evaluation, and Knowledge of individual pupils. While the concept of teachers' pedagogical skills is debated in the literature (Lederman & Gess-Newsome 2009), there is general agreement that the development of teachers' pedagogical skills is embedded in classroom practice (Van Driel, Verloop & De Vos, 2008), implying that novice teachers and experienced teachers who have not taught a particular topic before may have little or no pedagogical skills in that specific area. On the other hand, successful teachers in basic science who promote pupils' learning, are likely to have well-developed pedagogical skills in that specific basic science.

Ponte, Beijaard, and Ax (2004) as part of a large research project facilitated seven groups of teachers in six schools to undertake action research over two years. The purpose was to develop the pedagogical skills of teachers on basic science. The findings indicate that an action research program for professional development has the best chance of success if the teams of teachers and teacher educators have a shared understanding and input in the program. An important aspect of pedagogical skills development of teachers has been highlighted by the same team in another paper (Konig, Blomeke, Paine, Schmidt, & Hsieh, 2011).

Pardhan and Wheeler (2008) have researched the development of pedagogical skills of basic science teachers to promote basic science teaching in the context of Pakistan. Her findings support collaborative action research and critical reflection for improved development of teachers' pedagogical skills and also find that with

support teachers can build a community of learners. However, the formation of community and developing trust takes time at least in the context of Pakistan where such collaborations are rare and novel and are generally not supported by the school management. Igboegwu (2012) who worked in a similar environment as Pardhan and Wheeler (2008) supported reflection in the form of reflective conversations for the development of teachers. They also presented the tensions involved in developing trust and open-mindedness. In particular, open-mindedness requires an acknowledgement that there are multiple ways of viewing events, and to develop this worldview was a time-consuming process. The current teaching practices in Basic Science classrooms are barely behaviourally requiring pupils to reproduce what the teacher taught them. Therefore, there is the need to introduce teaching practices that are learner-centred in Basic Science classrooms to inculcate the spirit of production or construction of knowledge by the learners. This was what informed this study to evaluate the influence of SDG on Basic Science teachers' attitude, pedagogical skills, and pupils' achievement in Basic Science in Sokoto state, Nigeria.

The review of the related literature such as those of Yusuf, Ajidagba and Olumirin, (2010), Ashang (2012), Okoye (2013), Eze and Eze (2013), Ugwu and Ofuebe (2013), and Apollania, Ebere & Oyetola (2013) indicated that various studies have been conducted in this area. Similar to this study was conducted by Ukah (2013) on implementation of basic science and technology curriculum. However, the present study is different when compared to Ukah (2013) as the study takes place in Sokoto State using a descriptive survey design to evaluate the influence of SDGs on teachers' pedagogical skills on pupils' academic achievement in basic science. Apollania, Ebere, and Oyetola (2013) investigated the effect of the students' and teachers' improvised instructional materials on the academic achievement of students in biology. However, while Apollania, Ebere, and Oyetola's (2013) study centred on students' academic achievement in biology, this study is centred on pupils' academic achievement in Basic Science in Sokoto State, Nigeria. Okoye (2013) researched the teachers' knowledge of the



content and activities of the basic science curriculum. However, this study intends to evaluate the influence of SDGs on teachers' pedagogical skills and pupils' academic achievement in Basic Science in Sokoto State. The relationship between the study and this study is the evaluation of the teachers' knowledge of the content and activities of the basic science curriculum at the basic school level.

The study is also unique from the previous studies as the population used for the study is 54,612 JSS II pupils and 241 basic science teachers. A sample of 256 JSS II pupils and 107 teachers. Two research instruments; Basic Science Teachers Pedagogical Skills and Attitude Questionnaire (BSTPSAQ) and Eggleston Basic Science Teachers Observation Schedule (EBSTOS) were used for data collection. The hypotheses raised were tested using both parametric and non-parametric inferential statistics at $p \leq 0.05$ level of significance.

Research Question and Hypothesis

The study aims to: Assess the pedagogical skills of Basic Science teachers trained under Sustainable Development Goals (SDG) 4 in Sokoto State.

Research Question

One research question was raised to guide the study, which stated that:

1. To what extent are the pedagogical skills of Basic Science teachers trained under Sustainable Development Goals (SDG) 4 and those not trained under SDG 4 in Sokoto State.

Hypothesis

The study tested one null hypothesis at a $P \leq 0.05$ level of significance.

HO₁ There is no significant difference between trained and untrained Basic Science teachers under SDG (4) with regards to their mean pedagogical scores towards Basic Science skills in Sokoto State.

METHODOLOGY

This study used a survey research method in which treatment by subject design was

employed because the basic teachers used for the study had already gone through an SDG training program in 2016 which serve as treatment for the subject used.

The population for this study was made up of all the Basic Science teachers in Upper Basic level in Sokoto State. According to SUBEB (2018), there were 222 Upper Basic level schools in Sokoto state with a population of 241 Basic Science teachers at the time of this study. Out of this number, only 51 trained under SDG across the 4 Zonal Education Offices (ZEOs). The remaining 190 are yet to receive SDG training as at the 2016/2017 academic calendar. Two categories of schools were involved in this study, SDG Schools and non-SDG schools. The population also involved two different genders.

To have a basis for fair analysis of the data to be collected, a purposive sampling technique was used to select two schools each from the four Education Zones. In each zone, one of the schools selected has a male teacher or a female teacher who either receives SDG training or otherwise. In each of the selected schools, a single class was randomly selected to participate in the research. Therefore, the sample of teachers used in this study included 51 SDG trained teachers and 56 non-SDG trained teachers. The 56 non-SDG teachers that participated in the study were selected using a simple random sampling technique. Therefore, a sample of 107 Basic Science teachers was involved in this study. The selection of the sample teachers was based on Central Limit Theorem which according to Sambo (2008), a sample as big as 30 is enough to produce a normal result and represent a given population.

There were two types of data collected in this study; primary and secondary data. The primary data were collected through the Basic Science Teachers Pedagogical Skills and Attitude Questionnaire (BSTPSAQ) and Eggleston Basic Science Teacher Observation Schedule (EBSTOS), while the secondary data were obtained from the students' results. Therefore, only one instrument was used to collect data for this study. First, the BSTPSAQ questionnaire was administered to seek the teachers' responses about their attitudes and teaching practices. The ESBTOS was used to assess the pedagogical



skills of Basic Science teachers. The BSTPSAQ was divided into three sections. Section A deals with the participants' profiles. Section B was about Basic Science Teacher Attitudes towards Basic Science with 29 statements. Section C was all about Basic Science Teachers Pedagogical Skills having 44 statements, which were divided into three categories with 16, 13, and 15 statements respectively.

The Eggleston Basic Science Teacher Observation Schedule (EBSTOS) was designed to assess the pedagogical skills of Basic Science teachers who received SDG training. This was an adaption of the Dreyfus and Eggleston (1976) teaching observation schedule. The features of modern teaching that encourage and support student-centred teaching and learning practices according to them were 23 which were in line with Murphy's (1997) learner-centred classroom characteristics. Therefore, the maximum obtainable score is 23 points to show if a teacher has fully implemented the strategies.

The two instruments BSTPSAQ and ESTOBS were given to experts in academia for both qualitative and quantitative measures. After validation the instruments were pilot tested at Sokoto North, Sokoto South, and Kware Local Government Areas. The researcher distributed 45 BSTPSAQ questionnaires to 45 teachers in a school from one of the local government areas. The instrument was administered once and data collected

The BSTPSAQ reliability indices were computed using the split-half method employing the odd and even number procedure by employing Cronbach's alpha statistical tool to compute the internal consistency of the items. Each section of

the BSTPSAQ had its measure reported separately. The reliability coefficient for BSTPSAQ was 0.87. The EBSTOS was administered to 6 teachers who were assessed twice each and the reliability index was computed using Kuder-Richardson KR-20. The reliability coefficient " r " = 0.79 was obtained which signified that the instrument was reliable.

The exercise lasted for four weeks. The researcher spent two days on a visit to each school. The respondents filled and return the instruments to the researcher instantly. The researcher personally administered the instrument to the teachers. Similarly, the researcher observed basic Science teachers who received SDG training as a focus group. The data collected were analyzed using descriptive statistics of percentages.

RESULTS

A research question was answered using mean difference. Table 1 results show the mean ranks of pedagogical skills scores of Basic Science teachers exposed to training under SDG and those not trained under SDG. The mean rank pedagogical skills score of Basic Science teachers exposed to training under SDG of (61.94) was higher than that of Basic Science teachers not exposed to training under SDG (45.96). The mean rank pedagogical skills difference was 15.98 in favour of Basic Science teachers exposed to training under SDG. This implies that Basic Science teachers exposed to training under SDG show more positive pedagogical skills in teaching Basic Science than those teachers not exposed to SDG training.

Table 1: Mean Pedagogical Skills Scores of Basic Science Teachers Exposed to Training Under SDG and Those not Trained Under SDG

Training	N	Mean Rank	Sum of Ranks	Mean Ranks Difference
Trained	50	61.94	3097.00	15.98
Untrained	56	45.96	2574.00	
Total	106			

Null Hypothesis

There is no significant difference between the mean score in Basic Science pedagogical skills of teachers trained under SDG and those not trained

under SDG in Sokoto State. This null hypothesis was tested using the nonparametric statistics of the Mann-Whitney U test. The result of the analysis is presented in Table 2



Table 2: Summary of Mann-Whitney U test of Teachers Trained and Not Trained under SDG on Basic Science Mean Pedagogical Skills

Training	N	Mean Rank	Sum of Ranks	Df	Mann-Whitney U	Z	p	Remark
Trained	51	61.94	3097.00	104	978	-2.671	0.008	S
Untrained	56	45.96	2574.00					
Total	106							

In Table 2, the result reveals that the p-value of 0.008 recorded is less than the value of 0.05, meaning that there is a significant difference in pedagogical skills between teachers trained under SDG and those not so trained as indicated in their mean rank scores. Therefore, the null hypothesis which says there is no significant difference is rejected. This implied that Basic Science teachers exposed to training under SDG differ from teachers not exposed to SDG training in their pedagogical skills in the teaching of Basic Science. A significant difference was found between the mean score in Basic Science pedagogical skills of teachers trained under SDG and those not trained under SDG in Sokoto State.

DISCUSSION

Table 1 presents the mean ranks pedagogical skills scores of Basic Science teachers exposed to training under SDG and those not trained under SDG. And in Table 2 the result shows that there is a significant difference between the mean score in Basic Science pedagogical skills of teachers trained under SDG and those not trained under SDG in Sokoto State. This implies that Basic SDG retraining of teachers could improve teachers' pedagogical skills in Basic Science. This is consistent with the findings of Shaleigh (2004), Pardhan and Wheeler (2008), Igboegwu (2012), and Ashang (2012) who in separate studies supported the view that SDGs retraining of teachers improves the development of teachers' pedagogical skills in basic science teachers. The findings support the evidence that MDGs training programmes facilitate the implementation of the Basic Science and Technology Curriculum in primary schools. The probable reason for this result could be because these teachers were earlier used to the lecture method. Besides, many of them could have been out of school for long without retraining. Teachers whose orientation is highly skewed towards

teaching children to pass examinations and who do not utilize the teachers' Pedagogical Skills cannot positively impact SDG 4 and consequently on the other 16 SDGs. In other words, a teacher education curriculum that emphasizes the development of cognitive competencies will 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 & 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 & Alcott (2015) called for appropriate training incorporating practical classroom experience, which will enable teachers to support children to learn the basic skills and to progress at the right place. It thus implies that if teachers in government schools often lack the proficiency to do their work, the government cannot deliver inclusive, equitable quality education, if it does not improve the capacity of teachers in all the levels of the education system.

CONCLUSION

Based on this evidence the study concludes that SDGs teacher's retraining program is an important exercise for teacher professional development and pupil academic achievement in Basic Science. The study revealed that SDG training has an impact on teachers' pedagogical skills.



RECOMMENDATIONS

Findings of the study are used as the basis of the following recommendations:

1. The government should regularly train and retrain Basic Science Teachers to improve their pedagogical skills.
2. The pedagogical skills of male and female Basic Science teachers should be appraised periodically by the education inspectors to keep them alert and updated.
3. Parent Teachers Association and Non-Governmental Agencies (NGO) should also come to the aid of Basic Science Teachers training and retraining as this would improve pupils' academic achievement in the subject.

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