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Assessment of Challenges Associated with the Teaching and Learning of Science In Ghanaian Basic Schools

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ABSTRACT

This study sought to assess the challenges associated with the teaching and learning of science in Ghanaian Basic schools. The sample consisted of 90 respondents made up of 50 Basic school science teachers and 40 Basic school pupils drawn from Cape-Coast Metropolis. A purposive sampling technique was used to select the sample for the study. Questionnaire and interview were the research instruments used for the study. The Basic school pupils revealed that inadequate science practical activities, lack of good learning materials and pupils' fear for science subject were the problems that hinder the learning of science. The science teachers also indicated that lack of teaching and learning materials, lack of science laboratories, overcrowded classrooms and presence of pupils' misconceptions about science were some of the problems that impede the teaching of science. It was recommended that government of Ghana and other related stakeholders in science education should build science laboratories/practical rooms in all Basic schools and equip them with needed TLMs to aid science teachers do more practical activities so as to demystify science and make it more interesting for the pupils.

Keywords : Assessment, Challenges, Associated, Teaching, Learning, Science.

I. INTRODUCTION

Ghana education system has undergone several metamorphoses after its independence in 1957 with the aim of improving quality of education at all levels through various educational reforms. Currently, the Ghanaian education system is been regulated by Education Act, 2008 (Act 778) which puts education system into three progressive levels namely: Basic education, Secondary cycle Education and Tertiary Education (Amankwaah, 2014).

The Basic educational system consists of 2 years kindergarten; 6 years primary school and 3 years Junior High school (JHS). The 2 years kindergarten (pre-school) is not compulsory. However, the primary school and JHS are compulsory for all children between the ages of 6-14 years. The aim of the Basic education is to produce well-balanced individuals with the requisite knowledge, skills, values, aptitudes and attitudes to become functional and productive citizens for the total development and democratic advancement of the nation (Amankwaah, 2014; Amoah, 2017).

In order to achieve this laudable aim, several subjects such as science, mathematics, English, and among others have been developed for the Basic (primary and JHS) pupils to study. Of all the subjects offered in the Ghanaian Basic schools, studies by (Karikari-Ababio, 2003; Akyeampong, 2007; Mitchell Group, 2009; Buabeng, Owusu & Ntow, 2014) have shown that science subject have been and continue to be difficult subject for these pupils resulting in declining academic performance and poor attitudes towards science subject.

Several pioneer studies (Odzen, 2007; Buabeng, Owusu & Ntow, 2014) have reported horrible results with regards to JHS (grades 7- 9) pupils' performance in science in Ghana. In a study, Odzen (2007) reported that out of 786, 284 JHS pupils who took secondary school education entrance exams in 2005; as many as 65,076 students scored zero percent (0%) in the science exams.

In a comparative study on Ghana's JHS 2 (grade 8) pupils' achievements in Trends in International Mathematics and Science Study (TIMSS) in 2003, 2007 and 2011, Buabeng, Owusu and Ntow (2014) concluded that although Ghana's JHS 2 pupils' achievement has shown some improvement, yet this achievement has been consistently poor relative to the TIMSS benchmarks since her participation in 2003. The study revealed that although Ghana's performance in 2007 was a significant improvement over that of 2003, but there was no significant improvement of the results as compared to that of 2007. The study further revealed that though there was slight improvement in 2011, Ghana's achievement was the lowest in Africa and the world at large. The study, concluded that Ghana's performance relative to other African countries gives some indications that Ghanaian Basic school pupils are not achieving at the levels expected when compared to pupils at comparable grade levels in different parts of world; and as such there is the need to assess the underlying causes of Basic school pupils' underperformance in science.

Odhiambo (2005) contended that there is a growing demand from the government and the public for teacher accountability. Heck (2009) also indicated that teachers should not escape a portion of blame when students perform poorly. This implies that teachers should be held responsible for every event that takes place in the teaching and learning process most especially when it comes to pupils' poor academic performance. Kimani, Kara and Njagi (2013) revealed that while blaming teachers for the poor performance of pupils, it very imperative to assess the challenges teachers and their pupils face in the teaching and learning of subject (science).

In as study Appiahene, Opoku, Akweittey, Adoba and Kwarteng (2014) reported that mathematics teachers faced a lot of challenges in the teaching of mathematics; and this may be applied to science. In a similar study conducted in Turkey, Esme (2004) revealed that Turkish science teachers faced a lot of challenges in teaching science to pupils.

It is hoped that when challenges faced by teachers and students are brought to light, it would help improve science teaching and learning in Ghanaian Basic schools and elsewhere in the world thereby impacting positively on the students' performance and attitude towards science.

Statement of the Problem

Science educators, parents and other stakeholders in science education have been worried about the poor performance of Ghanaian Basic school pupils in the BECE as well as TIMMS science results for quite some time now. The WAEC Chief Examiners Reports (1993-2014) revealed that the BECE science continues to yield poor results year after year. On his part, Bosson-Amedenu (2017) indicated that Ghana's Basic schools regularly fail to produce knowledgeable graduates, capable of pursuing further education due to declining academic performance in the BECE results.

As stated in the introduction, within the last decade, Ghana's JHS 2 (grade 8) pupils' continues to perform significantly below other African nations in cross-national comparisons in TIMSS 2003; 2007 and 2011 science results (Mitchell Group, 2009; Buabeng, Owusu & Ntow, 2014). For example, in 2003 TIMSS report, out of the 46 participating countries in JHS

category, Ghana placed 45th position in science with an average score of 255 as against the International Average Benchmark (IAvB) of 474. Again, in 2011, Ghana placed 42nd position in science with an average score of 306 as against the IAvB of 500 (Buabeng, Owusu & Ntow, 2014).

Studies (Medupe, 1999; Odzen, 2007) have attributed this poor performance in science to the challenges Basic school science teachers and pupils faced in the teaching and learning of science. For example, in a study, Medupe (1999) indicated that South Africa Basic school science teachers faced a lot of challenges including lack of equipment and overcrowding in schools.

Since poor academic performance in science among Basic school pupils have been attributed to the challenges faced by teachers and pupils globally, it is imperative to assess the challenges faced by Ghanaian Basic school science teachers and their pupils in the teaching and learning of science.

Purpose of the Study

This study sought to assess the challenges associated with the teaching and learning of science in Ghanaian Basic schools. Specifically, the study intends to:

1. To examine the challenges faced by Basic school pupils in the learning of science.
2. To assess the challenges faced by Basic school science teachers in the teaching of science.

Research Questions

The following two (2) investigative questions directed research activity in the study:

1. What challenges do Basic school students face in the learning of science?
2. What challenges do Basic school science teachers encounter in the teaching of science?

II. REVIEW OF RELATED LITERATURE

It is very uncommon to work effectively and achieve better results when one faces challenges in his/her work place. Teaching is an act of imparting meaningful knowledge from a source (teacher) to the young ones (students). Effective science teaching and learning cannot take place when the science teaching and learning environment is faced with a lot of challenges (Bajah, 1982; Medupe, 1999; Riess, 2000). Thus, for a teacher to work and achieve better results, all the challenges that impede effective science teaching and learning in schools must be assessed and properly addressed.

In a study conducted in Nigeria, Bajah (1982) indicated that lack of:- physical facilities, classroom furniture, service points, teacher's demonstration table, equipment and apparatus, human resources, qualified science teachers are some of the challenges that hinder effective teaching and learning of science. In a similar study in South Africa, Medupe (1999) also mentioned lack of science equipment and laboratory, overcrowded schools, under-qualified teachers and lack of epistemological knowledge about science are some of the challenges confronting science teaching and learning.

In another study in Germany, Riess (2000) pointed out that students' lack of interest and motivation in the science subject, students' poor understanding of scientific concepts, as well as students' lack of comprehension of the epistemological role of science are some of the problems or challenges that impede the effective science teaching and learning in schools. It is obvious that literature is full of evidence to suggest that science teachers and pupils across the globe have been and continuously confronting with challenges that impede the teaching and learning of science in schools.

III. METHODOLOGY

Research Design

The study employed descriptive survey research design. This design was used because it allows the use of multiple data collection tools in seeking to address the research questions in an in-depth manner. Again, was used because it emphasizes objective measurement and the statistical analysis of data collected through questionnaires or by manipulating pre-existing statistical data using computational techniques.

Research Instruments

Questionnaire and interview were the research instruments used to collect data from the respondents. Two (2) questionnaires namely Science Teachers' Questionnaire (STQ) and Pupils' Questionnaire (PQ) were developed and used for the study. The STQ was used to collect data from Basic school science teachers whereas the PQ was used to collect data from the pupils.

A semi-structured interview guide was used to gather additional information that was not provided for in the questionnaires. In addition, written documents such as diary notes and audiotapes were made to augment information obtained from the main instruments to ensure triangulation of data.

Data Collection Procedure

Permission was sought from the school authorities, teachers and the pupils of the selected schools to carry out the study. Upon series of engagements and meetings, a date and time were agreed. In all, five (5) days were used to collect data from the respondents. In the agreed date and time, the STQ was administered to the teachers whereas PQ was also given to the pupils in the selected school to answer in my presence. After the stipulated time, all the questionnaires were collected and this process ensured 100% retrieval rate of all the questionnaires administered.

After, the administration of the questionnaires, focus-group interview sessions were done for respondents to obtain additional information on the topic under study.

Data Analysis Method

The study employed both quantitative and qualitative methods of data analysis. Data from the questionnaires were analysed quantitatively using descriptive statistics mainly frequency and percentages. Data from the interview sessions were also analysed qualitatively. The recorded conversations with the teachers and pupils were transcribed, analysed and summarised thematically.

IV. RESULTS AND DISCUSSION

Analysis of the Results

The analyses of the results were done to answer the 2 research questions posed by the study.

Research Question 1: What challenges do Basic school pupils face in the learning of science?

In order to assess the challenges encountered by Basic school pupils in the learning of science, pupils' responses to PQ question items were analysed quantitatively using frequency and percentages and are orderly presented in Table 1 below:

Table 1 : Pupils' Responses on Challenges They Face In Learning of Science

No.	Items on problems faced by pupils in learning science.	Frequency	Percentage
1	Lack of science	40	100

	laboratories / practical rooms.		
2	Lack of good learning materials.	39	97.5
3	Lack or inadequate science practical activities.	38	95.0
4	Pupils' fear for the science subject.	36	90.0
5	Use of abstract concepts in teaching science by teachers.	34	85.0
6	Lack of furniture and space in classrooms.	31	77.5
7	Lack of competent science teachers.	30	75.0
8	Poor attitude towards science teaching by some teachers.	28	70.0
9	Threating teaching and learning environment.	23	57.5
10	Non-availability of relevant and appropriate textbooks.	20	50.0
11	Limited science periods.	15	37.5
	Total	**40**	**100**

Source: (Pupils' Questionnaire, 2018)

Responses in Table 1 show that several challenges impede the learning of science by Basic school pupils who took part in the study. From Table 1, some of the identified challenges include lack of science laboratories/practical rooms, lack of good learning materials, lack or inadequate science practical activities, pupils' fear for the science subject, use of abstract concepts in teaching science by teachers, and lack of competent science teachers.

From Table 1, the most serious identified challenge was lack of science laboratories/practical rooms whereas the least challenge was the limited science periods. This is because, all the 40 pupils representing 100% agreed that lack of laboratories/practical rooms, whereas only 15 pupils representing 37.5% also indicated the limited science periods.

Other challenges that were mentioned by the pupils during the focus-group interview sessions include lack of parental support, teachers' absenteeism, laziness on the part of some science teachers and lack of computers and other resources for private studies at home.

Research Question 2: What challenges do Basic school science teachers encounter in the teaching of science?

In order to investigate challenges faced by Basic school science teachers in the teaching of science, all the 50 teachers' responses to STQ question items were analysed quantitatively using frequency and percentages and are presented orderly in Table 2 below:

Data in Table 2 reveals that Basic school science teachers who took part in the study face numerous challenges that impede effective teaching of science. From Table 2, some of the challenges identified by teachers include lack of TLMs, lack of science laboratories/practical rooms, overcrowded classrooms, presence of pupils' misconceptions about science, heavy teaching workload on the teachers, pupils' poor attitude towards science, and many others.

The most serious challenge identified in this study was lack of TLMs whereas insufficient science periods allocation on schools' time table was the least. For example, in Table 2, all the 50 teachers representing

100% agreed that lack of lack of TLMs while only 29 representing 58% indicated insufficient science periods allocation impede science teaching.

Table 2 : Teachers' Responses on Challenges They Face in Teaching of Science

No	Items on problems faced by teachers in science teaching	Frequency	Percentage
1	Lack of teaching and learning materials (TLMs).	50	100
2	Lack of science laboratories/practical rooms.	48	96
3	Overcrowded classrooms.	47	94
4	Presence of pupils' misconceptions about science.	46	92
5	Lack of in-service training for Basic school science teachers.	45	90
6	Heavy teaching workload on the teachers.	42	84
7	Assessment mode using exams scores for achievement criterions.	41	82
8	Pupils' poor attitude towards science.	39	78
9	Pupils' inability to mention and explain science terminologies	37	74
10	Pupils' inability to communicate in the English language.	34	68
11	Lack of furniture in classrooms.	33	66
12	Insufficient science periods allocation on schools' time table.	29	58
	Total	**50**	**100**

Source: (Teachers' Questionnaire, 2018)

Other challenges that were mentioned by the teachers during the focus-group interview sessions include non-availability of appropriate textbooks, influence of superstitions towards science teaching and insecure teaching environments.

V. Discussion of the Results

The results of this study showed that several challenges impede effective learning of science by Ghanaian Basic school pupils who took part in the study. The most serious challenge that confronted pupils' learning of science was lack of science laboratories/practical rooms. This means that most Basic schools do not have science laboratories or practical rooms that can be used by pupils for the learning of science. This implies that pupils cannot perform and learn practical activities associated with various scientific concepts.

Other challenges identified by the pupils include lack or inadequate science practical activities, pupils' fear for the science subject, lack of parental support, teachers' absenteeism and lack of computers for private studies at home.

It was also found out that numerous challenges hinder effective science teaching by Basic school science teachers. The most serious challenge that hinders effective teaching of science was lack of TLMs. This means that teachers cannot organise activity-oriented lessons effectively for the pupils due to lack TLMs. Other challenges identified by the science teachers include but not limited to lack of science laboratories/practical rooms, overcrowded classrooms, presence of students' misconceptions about science, lack of in-service training, influence of superstitions towards science and insecure teaching environments.

The findings from this study lend credence to the findings of some pioneer researchers (e.g. Bajah, 1982; Medupe, 1999; Esme, 2004; Odzen, 2007) that science

teachers and pupils all over the world have been confronting with one or numerous challenges that impede the smooth and effective science teaching and learning in schools.

VI. Conclusions

Based on the findings of the study, the following conclusions were drawn:

It can be concluded that Ghanaian Basic students faced a lot of challenges in the learning of science. The most serious challenge was lack of science laboratories or practical rooms. Other challenges identified by the students include lack or inadequate science practical activities, students' fear for the science subject, lack of parental support, teachers' absenteeism and lack of computers and other resources for private studies at home.

It can also be concluded that Ghanaian Basic schools science teachers encountered numerous challenges in the teaching of science. The most serious challenge was lack of teaching and learning materials whereas insufficient science periods allocation on schools' time table was the least. Other challenges identified by the teachers include but not limited to lack of science laboratories and practical rooms, overcrowded classrooms, presence of students' misconceptions about science, lack of in-service training, heavy teaching workload, students' poor attitude towards science, influence of superstitions towards science and insecure teaching environments.

VII. Recommendations

Based on the findings and conclusions drawn, it is recommended that: -

1. This study should be replicated in other Regions in Ghana using a much larger sample. This would provide a basis for more generalisation of conclusions to be arrived at about the challenges associated with the science teaching and learning in Ghanaian Basic schools.
2. The government of Ghana and other related stakeholders in science education should build science laboratories/practical rooms in all Basic schools and equip them with needed TLMs to aid science teachers to do more practical activities so as to demystify science and make it more interesting for the pupils.

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