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Challenges Science Teachers Encounter In The Teaching Of Practical Lessons In Science: A Case Study Of Four Senior High Schools In The Ejisu-Juaben Municipality

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Abstract: ***This research was designed to investigate the challenges science teachers of Senior High Schools in the***

I. INTRODUCTION

In Ghanaian schools, Integrated Science is a subject of study that encompasses Biology, Chemistry, Physics and Agricultural Science (Abbey, Essiah, Ameyibor, Seddor, Nyavor & Wiredu, 1990). It is therefore a revolutionary introductory science curriculum intended to introduce students to the basic fundamental concepts in the aforementioned bodies of knowledge. This is to inform and equip learners with basic scientific knowledge, to make them better understand and relate to the physical world especially; in this modern scientific and technological era.

As part of the course in Science, students need practical skills to prepare them for further laboratory and field work in their future fields of study or specialization. Many within the science education community and beyond see practical work as an essential feature of science education. (Bennett, Metcalfe, Scanlon, Thomas & Williams, 1995),

Indeed, the practical aspect of the Science courses accounts for forty percent (40%) of the assessment at every stage of evaluation during the years of instruction at the senior high school and definitely the final West African Senior School Certificate Examination (WASSCE) which culminates in the award of the West African Senior School Certificate. (G.E.S. Syllabus for Integrated Science)

Practical activities in science can be defined as "learning experiences in which students interact with materials or with secondary sources of data to observe and understand the natural world" (Lunetta, Hofstein & Clough, 2007). If the purpose of practical work is to gain an understanding of scientific investigations, Hodson (1996) believes then that, LEARNING SCIENCE has to be linked with DOING SCIENCE. Wellington (1998) also argues that practical work in school science may be used by teachers as illustrations of phenomena, to give students a feel of the phenomenon, and/or as exercises or steps to follow to develop a particular skill.

Practical work in science includes laboratory work and field work. (Miller, 2004)

Many within the science education community and beyond see practical work as an essential feature of science education. (Bennett, Metcalfe, Scanlon, Thomas & Williams, 1995),

This assertion is rightly so due to the following reasons and more:

- ✓ Practical activities encourage purposeful inquiry that is more student-directed.
- ✓ Improving students' understanding of scientific concepts.
- ✓ Developing practical skills in use of equipment and devices.
- ✓ To encourage accurate observation and careful recording.
- ✓ To promote simple, common-sense, scientific methods of thought, thereby developing understanding of scientific enquiry
- ✓ Enhancing students' ability to co-operate with other classmates towards the execution of common assignments.
  To make biological, chemical and physical phenomena more real through actual experiences thereby reinforcing the integration of theory and practice.
- ✓ Improve student motivation in the study of Science.
- ✓ To prepare students for assessed practical work, especially the final (WASSCE) examinations.
- ✓ Practical activities encourage the application of the knowledge obtained in real-life through innovation and problem solving. (Abrahams & Saglam, 2010, p. 726, Woodley (2009) and Miller (2004)

The conduct of practical activities in science requires the following, among many others

- ✓ The Laboratory (both real and virtual)
- ✓ Equipment and Requirements.
- ✓ Infrastructure
- ✓ Field Trips
- ✓ Capability and Competency of science teachers
- ✓ Competent Laboratory Technicians, etc.

STATEMENT OF THE PROBLEM

Performance of students in the West African Senior School Certificate Examination (WASSCE), over the years in Integrated science has not been encouraging (Chief Examiner's Report 2006, 2007,2008,2009,2010, 2011, 2012, 2013, 2014). It has been identified that this mass failure is due to students' abysmal performance in the practical papers in these sciences (Chief Examiner's Report 2006- 2014). This sad situation may be due to inadequate instruction (teaching) of students in practical science by teachers among many other factors.

Performance of senior high school students in the sciences in the Ejisu-Juaben Municipality of the Ashanti Region of Ghana is a reflection of this national situation. This problem is what the researcher seeks to investigate; to find the challenges teachers encounter in the teaching of practical science in the municipality, and hopefully, suggest some solutions to these challenges.

OBJECTIVES OF THE STUDY

- ✓ To investigate the challenges science teachers of Senior High Schools in the Ejisu-Juaben Municipality face in the availability of equipment and requirements to facilitate the conduct of practical Science.
- ✓ To investigate the challenges teachers face in the availability of infrastructure in the conduct of Science practicals.
- ✓ To investigate the challenges teachers face regarding their competencies in the conduct of practical science.

RESEARCH QUESTIONS

- ✓ What are the challenges science teachers of Senior High Schools in the Ejisu-Juaben Municipality face in the availability of equipment and requirements to facilitate the conduct of practical lessons in science.
- ✓ What are the challenges teachers face in the availability of infrastructure in the conduct of practical lessons in science.
- ✓ To investigate the challenges teachers face regarding their competencies in the conduct of practical lessons in science.

II. RESEARCH DESIGN

The research design adopted for this study was descriptive survey, which involved administration of questionnaire and interviewing of subjects. Obtaining data from a large group of people to a set of carefully designed and administered questionnaire lies at the heart of survey research. (Fraenkel and Wallen, 1990). Discriptive design also makes room for in-depth follow -up questions to be made (Fraenkel and Wallen 1990)

Before the statements (items) of the questionnaire were framed, the researcher had discussions with 15 experienced science teachers to pick their thoughts on the difficulties they encountered in the teaching of practical lessons. There were also meetings with a professor of education and a retired science teacher to fine-tune the items (statements). These steps were necessary to ensure the validity and accuracy of the questionnaire, as much as possible.

SAMPLE SIZE, SAMPLING TECHNIQUE AND SAMPLE FRAME

In the choosing of the schools, random sampling was used. And purposive sampling was used for the selection of the science teachers. The population of teachers, was all the science teachers in the four chosen senior high schools in the Ejisu-Juaben municipality. Upon reception of the responses, sixty (60) out of the eighty (80) questionnaire were answered and returned. When the responses were analysed, it was observed that of the sixty (60) science teachers; forty-two (42); representing 70% were male and eighteen (18); representing 30% were female.

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RESEARCH INSTRUMENT

The Questionnaire consisted of two sections: Section A and Section B.

While section A featured open-ended items; Section B employed a five-point likert scale in soliciting for responses to the items/statements. The key to the likert scale was as follows: Strongly Agree (SA) -5; Agree (A) -4; Neutral (N) -3; Disagree (D) - 2 and Strongly Disagree (SD) -1.

DATA COLLECTION PROCEDURE AND ANALYSIS

A set of twenty questionnaire were administered to science teachers in each of the four schools as follows- Five (5) pieces of questionnaire were given to teachers from each of the following subject areas: Biology, Chemistry, Physics and Integrated science. The results were later submitted to analysis by the Statistical Package for Social Sciences (SPSS) and quantitative analytical techniques were used in arriving at conclusions and inferences. Frequencies, percentages and tables were used for better illustration of the findings.

III. RESULT S AND DISCUSSION

- ✓ Science teachers in senior high schools in the Ejisu-Juaben municipality, encounter a serious deficit (average mean of 2.15) with the availability of equipment and requirements for the teaching of practical activities in science.
- ✓ There is a modest provision of infrastructure for the teaching of practical science, with an average mean of 3.08. But there is still a lot of room for improvement.
- ✓ Science teachers in the Ejisu-Juaben municipality have serious challenges with regard to their competencies in the teaching of practical lessons (average mean of 2.78)

A careful study of the tables provided reveals that, the challenges science teachers encounter in the conduct of practical lessons in science in the Ejisu-Juaben municipality entail;

- ✓ Serious lack of instructional time for practical activities.
- ✓ Serious lack of textbooks, furniture, materials and specimen
- ✓ Extremely low usage of virtual laboratories.
- ✓ The need for more physical laboratories to be provided.
- ✓ Inadequate space in the laboratories.
- ✓ Lack of refrigeration and air-conditioning in the laboratories.
- ✓ Inadequate knowledge and technical skills on the part of some science teachers.
- ✓ Lack of in-service training (INSET) in the conduct of practical science.

STATEMENT	Strongly Agree F(%)	Agree F (%)	Neutral F(%)	Disagree F(%)	Strongly Disagree F(%)	Total F(%)	MEAN	STANDARD DEVIATION
1. Practical activities are very important in the study of science.	56(93.3)	4(6.7)	-	-	-	60(100.0)	4.93	0.25
2. There is provision of time on my time table for practical activities.	-	22(36.7)	14(23.3)	12(20.0)	12(20.0)	60(100.0)	2.77	1.16
3. The time allotted for practicals on my time table is adequate.	-	-	-	14(23.3)	46(76.7)	60(100.0)	1.23	0.43
4. I have textbooks to instruct and guide the conduct of practical lessons.	-	4(6.7)	12(20.0)	24(40.0)	20(33.3)	60(100.0)	2.0	0.90
5. The textbooks are sufficient in number to meet the demands of teachers and students.	-	-	4(6.7)	11(18.3)	45(75)	60(100.0)	**1.32**	**0.60**
6. I organize field trips as part of practical science.	-	13(21.7)	6(10.0)	9(15.0)	32(53.3)	60(100.0)	**2.0**	**1.24**
7. My field trips are supported and facilitated by my school's administration.	-	5(8.3)	6(10.0)	12(20.0)	37(61.7)	60(100.0)	1.65	0.97
8. Furniture is available in the right numbers to meet demand.	-	38(63.3)	9(15.0)	10(16.7)	3(5.0)	60(100.0)	3.37	0.94
9. I have a refrigerator for cold storage of chemicals, reagents etc.; if need be.	-	-	4(6.6)	7(11.7)	49(81.7)	60(100.0)	1.32	0.80
10. I receive adequate provision of materials and specimen for practical lessons	-	-	14(23.3)	30(50.0)	16(26.7)	60(100.0)	1.97	0.71
11. The materials and specimen are provided on time.	3(5.0)	2(3.3)	9(15.0)	29(48.3)	17(28.3)	60(100.0)	2.08	1.01
12. I use ICT and computer based methods to teach some practical lessons	-	11(18.3)	9(15.0)	9(15.0)	31(51.7)	60(100.0)	2.0	1.20
13. I use the INTERNET or VIRTUAL LABS to teach some practical lessons.	-	3(5.0)	2(3.30)	5(8.3)	50(83.3)	60(100.0)	1.3	0.77
14. I have to make extra time to teach practical lessons outside normal instructional periods.	54(90.0)	3(5.0)	-	3(5.0)	-	60(100.0)	4.8	0.7

Table 1: Challenges Science Teachers encounter in the availability of Equipment and Requirements for the teaching of practical lessons in Science

STATEMENT	Strongly Agree F(%)	Agree F (%)	Neutral F (%)	Disagree F (%)	Strongly Disagree F (%)	Total F (%)	MEAN	STANDARD DEVIATION
15. There is a dedicated laboratory for Biology in my school.	22(36.7)	25(41.7	-	13(21.7)	-	60(100.0)	3.9	1.2
16. There is a dedicated laboratory for Chemistry in my school.	19(31.7)	25(41.7	-	16(26.7)	-	60(100.0)	3.8	1.2
17. There is a dedicated laboratory for Physics in my school.	19(31.7)	21(35.0	4(6.7)	13(21.7)	3(5.0)	60(100.0)	3.7	1.3
18. My science lab is well equipped for the conduct of practical lessons.	-	-	17(28.3)	24(40.0)	19(31.7)	60(100.0)	2.0	0.8
19. My lab. is spacious enough to accommodate the classes I teach.	10(16.7)	9(15.0)	17(28.3)	16(26.7)	8(13.3)	60(100.0)	3.0	1.3
20. I have air conditioning in my lab to preserve the	-	-	-	-	60(100.0	60(100.0)	1.0	0.0

chemicals and reagents that require such storage condition.								

Table 2: Challenges Science Teachers encounter in the availability of Infrastructure for the teaching of practical lessons in Science

IV. CAPABILITIES AND COMPETENCIES

STATEMENT	Strongly Agree F (%)	Agree F (%)	Neutral F (%)	Disagree F (%)	Strongly Disagree F (%)	Total F (%)	MEAN	STANDARD DEVIATION
21. I am teaching subjects I trained to teach at the University.	21(35.0)	6(10.0)	5(8.3)	22(36.7)	6(10.0)	60(100.0)	3.23	1.5
22. I am competent enough to teach ALL the practical requirements of the curriculum.	-	-	9(15.0)	19(31.7)	32(53.3)	60(100.0)	1.62	0.7
23. I receive IN-SERVICE TRAINING (INSET) in the conduct of practical lessons.	-	11(18.3)	2(3.3)	12(20.0)	35(58.3)	60(100.0)	1.82	1.6
24. I would welcome IN-SERVICE TRAINING (INSET) in the conduct of practical lessons.	60(100.)	-	-	-	-	60(100.0)	5.0	0.0
25. I have adequate technical support in the lab.	-	5(8.3)	23(38.3	12(20.0)	20(33.3)	60(100.0)	2.22	1.0
26. I have a laboratory assistant for my laboratory.	16(26.7)	28(46.7)	-	3(5.0)	13(21.7)	60(100.0)	3.52	1.5
27. My laboratory assistant is knowledgeable enough to support me in the lab.	-	5(8.3)	16(26.7	16(26.7)	23(38.3)	60(100.0)	2.0	1.0

Table 3: Challenges Science Teachers encounter in the area of Capabilities and Competencies in the teaching of practical lessons in Science

V. CONCLUSION

Results from this study indicates a clear agreement and understanding among senior high school science teachers in the Ejisu-Juaben Municipality of the importance of practical activities in enhancing students' motivation, extending their knowledge or understanding concepts, and raising their interests to study science. These would eventually reflect in better results of students in both internal and external examinations (WASSCE).

However, there is serious lack of the basic forms of equipment, requirements and infrastructure for the conduct of practical activities in science. There is also the challenge of below average teacher competence in the teaching of practical activities in science. These leave a lot of room for improvement.

VI. RECOMMENDATIONS

To ease the difficulty of science teachers in the conduct of practical lessons; and thereby improve the performance of students in the West Africa Senior School Examinations (WASSCE), the following recommendations are suggested.

- ✓ There must be sufficient time allocated for the conduct of practical science on the schools' time tables.
- ✓ There must be the prompt provision of textbooks, furniture, materials and specimen for the conduct of practical lessons
- ✓ Teachers must endeavor to use ICT and computer based methods in the teaching of practical science.
- ✓ The use of virtual laboratories must be adopted by teachers for the many wonderful advantages they offer.
- ✓ The Ghana Education Service in conjunction with the municipal assembly must quickly address the problem of inadequate space in the laboratories, by expanding existing facilities and building new ones.
- ✓ Refrigeration and or air-conditioning must be made available in the laboratories.
- ✓ There is also the need to enhance teachers' capabilities and competencies in the conduct of practical lessons through intensive and effective in-service training programs.
- ✓ There is also the need to recruit more certified and skilled laboratory assistants or technicians.

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