



The Effect of Science Resource Center's on the Teaching and Learning of Science in the Cape Coast Metropolis

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ARTICLE INFO

Published Online:
24 August 2018

ABSTRACT

The main purpose of the study was to investigate if the SRCs in Cape Coast Metropolis serve as teaching centers that create the opportunity for practical work and ICT transfer. Specifically, the study sought to ascertain how often the tools and equipment in the SRCs are used and assess if tools and equipment facilitate the teaching and learning of Science subjects. The design used for the study was the descriptive survey design as well as the cross-sectional study research. The population for the research comprised all science teachers, laboratory technicians and all SHS 3 science students from the three (3) science resource center schools in the Cape Coast metropolis namely St. Augustine's College, Mfantshipim School and Ghana National College. Simple random sampling was used to select the participants for the study. In all, 156 students, 3 laboratory technicians and 15 science teachers from the three SRC schools were selected for the study. The instruments used in collecting data were questionnaire and observation. It was found out that to a large extent the tools and equipment in the SRCs in the Cape Coast Metropolis facilitate the teaching and learning of Science subjects. It was recommended that SRCs should be established in all SHSs in the country to avoid the problems faced by the satellite schools and the host schools as well.

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KEYWORDS: Science Resource Center, Science and Technology, Information and Communication Technology

Introduction

Science and Technology form the basis for invention, for manufacturing and for simple logical thinking and action (Ministry of Education, 2007). This means that scientific and technological literacy is necessary for all individuals, especially in a developing country like Ghana which has to move faster in the attempt to raise the standard of living of its people.

Renner (1985) asserted that science at its roots is an active process, not facts or products, but the process of problem identification, experimentation, data interpretation, hypothesizing and testing. It is therefore necessary to array the individual students with comprehensive scientific concepts, ideas, thought patterns and processes to enable them become scientific libraries.

Science is a subject that contributes greatly to the quality of life, but its benefits are not fully utilized by society. This is because some of the progresses of science are controlled by individuals who have an inaccurate understanding of the nature of science (Collette & Chiappetta, 1989).

According to the Organisation for Economic Co-

operation and Development (OECD 2007), a large number of secondary school students participating in a PISA 2006 Scientific Literacy Assessment surveyed considered science to be important for understanding the natural world and that it usually improves people's living conditions. However, only half of them considered science to be especially relevant to them personally, and even fewer would like a career involving science. Consequently, students do not choose science in school and they do not gravitate towards science and technology-type occupations.

In Ghana the teaching and learning of Science in most classrooms is characterized by lecture and discussion method which does not promote effective teaching and learning of science. The nation cannot exist without enough scientists and technologists in this modern 'computer age'.

Instructional practices are too teacher-dominated and that students are expected to be passive learners. Students all too frequently are taught subject matter content at the expense of importance skills – psychomotor domain. Glickman (1991), for example, asserted that little has changed in classroom teaching over the past century. The majority of classroom time is spent on teachers lecturing,

students listening, students reading textbooks or students filling out worksheets.

There was the need therefore to adequately equip schools with science materials to enable them carry out hands-on-activities to enable science students think critically and objectively and arrive at conclusions based on provable facts. The Ghana Government recognize the importance of science in national development; and therefore provided basic and modern scientific equipment to aid the teaching and learning of science at the Senior High School (SHS) level. The Ghana Government established one hundred and ten (110) Science Resource Centres throughout the country so that facilities at the centres could be shared by all SHS students.

Statement of the Problem

The purpose of teaching Science at the Senior High School (SHS) level is to equip the students with the necessary process skills and attitude that will provide a strong foundation for further study in science at a higher level of education. It also provides the young person with the interest and inclination toward the pursuit of scientific work (Ministry of Education 2007). The Science syllabus makes a conscious effort to raise the level of scientific literacy of Science students in the SHS and equip them with the relevant basic scientific knowledge needed for their own survival and for the development of the country. It is also expected that scientific experiences in the SHS cultivate in students an interest for science that will urge them to seek further studies and careers in science. The study of science also provides excellent opportunities for the development of positive attitudes and values (Ministry of Education, 2007). The discipline covers the various fields of science subjects like, Physics, Chemistry, Biology and Agriculture.

There is the common understanding that in order for the country to develop and be self-sufficient, it has to reduce its reliance on the importation of science and technology from the developed nations. There have therefore been several calls for the country to manufacture its own machinery and equipments to support its industries as well as other sectors of the economy.

Towse (1997) noted that science education should not be seen as a necessary support for technological and economic stability and growth. Those involved in scientific and technological discoveries must not only know about science, they must be able to do science. He further noted that learning the facts of science might be properly accomplished through textbooks instruction.

In view of this, a lot of efforts have been made by the Ministry of Education to improve on science and technology in the country. For example, in the mid 90s, a major step initiated by the Ministry of Education in collaboration with USAID provided Science Resource Centres (SRCs) to one hundred and ten (110) Senior High Schools in the country with the aim of providing the

necessary tools and equipment for effective teaching and learning of Science. Nine of the centers were established in the Central Region and are located in Winneba SHS, Apam SHS, Mfantiman Girls SHS, Breman Asikuma SHS, Assin Manso SHS. The rest are, Aggrey Memorial Zion SHS, Ghana National College, Mfantipim School and St. Augustine’s College. Three of these centers are located in the Cape Coast Metropolis; Ghana National College, Mfantipim School and St. Augustine’s College to serve students in these schools and the satellite schools which include Holy Child School, Oguaa Secondary Technical, Adisadel College, Academy of Christ the King, University Practice SHS, Wesley Girls High School and Efutu SHS.

These SRCs were established to meet certain specific objectives such as serving as a teaching center and creating opportunity for practical work. In addition to this, they provide facilities for running the Science, Technology and Mathematics Education Clinics (STMEs) and the Global Learning and Observation to Benefit the Environment (GLOBE) Programme and In-service training for Science teachers.

An important component of the SRC strategy is the establishment of the National Internet Communication Technology in the schools to coordinate the activities of the SRCs. The SRCs are requested to:

1. Make the teaching and learning of Science more practical and less theoretical.
2. Increase students’ enthusiasm in the learning of Science due to hands-on activities relevant to teaching learning aids present.
3. Provide teachers and students the opportunity to become computer literates to fit into the modern information and technology age.
4. Keep teachers and students abreast with information in the scientific world via the internet.
5. Increase the number of students entering Science based courses at the universities and polytechnics.
6. Increase and retain the number of Science teachers entering the profession (Ossei-Anto, 1999).

The project began in 1995 as a collaborative effort between the Ghana government represented by the Ministry of Education (MOE) and Ministry of Finance and Economic planning and Philip Harris International of Britain represented by Douglas Arthur Limited, Accra Ghana. The contract sum was about £20 million sterling to cover equipment, buses, spare parts, training of trainers and overseas trainers’ fee. Each SRC had materials adequate for practical lessons. There were also at least two computers supplied to each (Biology, Chemistry and Physics) departments. This was to expose students to software programmes and help them rise up to the challenges of scientific advancement of our modern world (Ministry of Education, 1997).

These SRCs have been in operation since 1997. An impact assessment of the resource centers was conducted in

September 1998 in some selected schools by the National Coordinator of the SRC (Ministry of Education, 1997). Even though an impact assessment was conducted in some selected centers, a comprehensive assessment of the projects especially on the tools and equipment have not been done. It is therefore imperative to investigate if these centers and the tools and equipment supplied are being utilized adequately for their intended purpose hence the relevance of this research.

Purpose of the Study

The main purpose of the study was to investigate if the SRCs in Cape Coast Metropolis serve as teaching centers that create the opportunity for practical work and ICT transfer. Specifically, the study sought to:

1. Ascertain how often the tools and equipment in the SRCs are used
2. Assess if tools and equipment facilitate the teaching and learning of Science subjects.

Research Questions

The key questions that this research intended to address were:

1. How often are the tools and equipment in the SRC used for practical lessons?
2. To what extent do the tools and equipment in the SRC facilitate teaching and learning of Science subjects?

Methodology

The design used for the study was the descriptive survey design. Another design used was the cross-sectional study research. This design is best suited to studies aimed at finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population. The population for the research comprised all science teachers, laboratory technicians and all SHS 3 science students from the three (3) science resource center schools in the Cape Coast metropolis namely St. Augustine’s College, Mfantipim School and Ghana National College. Simple random sampling was used to select the participants for the study. In all, 156 students, 3 laboratory technicians and 15 science teachers from the three SRC schools were selected for the study. The instruments used in collecting data were questionnaire and observation.

Table 1: Number of hours used for practical lessons in SRCs

Responses	No. of Trs	%	No. of Lab Techs	%	No. Of Sdts	%
At least 1 hr / week	0	0	0	0	0	0
At least 2 hrs / week	12	80	0	0	130	83.3
At least 3 hrs / week	0	0	3	100	0	0
Not sure	3	20	0	0	26	16.7
Total	15	100	3	100	156	100

Source: Field Survey, 2010

The revised questionnaires were used in a pilot study to check the suitability (validity and reliability) of the items. The pilot study was also to find out whether the instructions accompanying the questionnaire were spelt out clearly to enable the respondents complete the items without difficulties. The pilot study was done in Aggrey Memorial Zion Senior High School in the Central Region of Ghana. The school was chosen because it has good number of science teachers and a well equipped SRC. Five (5) Science teachers, twenty (20) science students and two (2) laboratory technicians took part in the pilot study.

Three Research Assistants from the Department of Educational Foundations were engaged to assist in the pilot study as well as the collection of data during the field survey. They were taken through the questionnaires and other procedures required for data collection. This study was significant to help sharpen the instrument by making it possible for personal interactions with respondents to identify certain ambiguities that might characterize the original questionnaire. It was valuable because it was to enable thorough check on the data analysis procedure. Cronbach co-efficient alpha was used to calculate the reliability of the instrument. The reliability co-efficient of the instrument was found to be 0.78 which was high to be used to collect data for the actual study. Hence the pilot questionnaires were found to be reliable for their intended purposes.

Results/Discussion

Research Question 1: How often are the tools and equipment in the SRC used for practical lessons?

This research question was asked to find out if the tools and equipment in the SRCs are used for practical lessons. This is in view of the fact that the capacity of the SRCs to serve as avenues for providing practical work and ICT transfer depend largely on the use of the tools and equipment as aids to practical lessons. A number of questions were used to elicit information from respondents on how often they used the tools and equipment in the SRCs.

In the first place, respondents were asked to indicate the number of hours used for practical lessons in the SRCs. Table 1 presents the results.

As indicated in Table 1, the majority (80%) of teachers and students (83.3%) indicated that at least two hours a week was used for practical lessons in the SRCs. This finding is in line with the number of hours in the science syllabus prescribed by the Ministry of Education, Ghana (2003) that at least two hours should be spent in the SRCs for practical sessions. On the other hand, all the three (100%) laboratory technicians indicated they spent at least three hours per week on practical lessons. This is in order considering that they are almost always engaged in the SRCs for purposes of

practical lessons. Consequently, the laboratory technicians are more likely to spend more doing practical lessons compared to Science students and teachers.

Having identified the number of hours respondents spent at the SRCs for practical lessons, the study went further to ascertain from respondents how often tools and equipments in the SRCs were used during practical lessons. Table 5 indicates the how often tools and equipments were used in SRCs for lessons.

Table 2: How often Tools and Equipment in SRCs are used

Response	No. of Trs	%	No. of Lab Tech.	%
Once a week	2	13.3	1	33.3
Once every two weeks	7	46.7	2	66.7
Not at all	2	13.3	0	0
Not sure	4	26.7	0	0
Total	15	100	3	100

Source: Field Survey, 2010

From Table 2, out of the 15 teachers sampled, the majority (46.7%) teachers indicated that the tools and equipment were used once every two weeks for lessons. A similar trend was found on the part of laboratory technicians where more than 50 percent (66.7%) specified that they used the tools and equipment once every two weeks and (13.3%) specifying once a week. The above results points to the fact that, the dominant period of using the tools and equipment in the SRCs fell was once every two weeks.

However, the findings in Table 2 contradicts the assertion made by Ratcliffe, Collins and Miller (2000) that for students to get a good appreciation of Science subjects, it is important for them to use the tools and equipment in the SRCs once a week for practical lessons. The implication is that the more the tools and equipment are used for practical lessons, the more the students are better able to apply

scientific concepts and theories to real life situations (Duschl, 1990). Thus, students in the study area are likely not to get a better understanding of the Science subjects as they do not use the tools and equipment regularly.

Research question 2: To what extent do the tools and equipment in the SRC facilitate teaching and learning of Science subjects?

One of the main reasons for the establishment of the SRCs in Senior High Schools in Ghana was to facilitate the teaching and learning of Science Subjects (Ministry of Education, Ghana, 2003). The subjects included Physics, Chemistry, Biology and Information & Communications Technology (ICT). Fifteen years following the operation of SRCs, the above research question seeks to find out if the tools and equipments in the SRCs in the Cape Coast Metropolis facilitate the teaching and learning of Science subjects as indicated in Table 3.

Table 3: Facilitation of tools and equipment in SRC’s in teaching and learning of Science subjects

Responses	No. of Trs	%	No. of Lab Techs	%	No. of Sdts	%
Excellent	5	33.3	0	0	44.7	28.7
Very Good	8	53.3	0	0	65.4	41.9
Good	2	13.3	3	100	28.3	18.1
Poorly	0	0	0	0	17.6	11.3
Total	15	100	3	100	156	100

Source: Field Survey, 2010

The results in Table 3 show that all the respondents gave positive remarks about the facilitation of tools and equipment in the teaching and learning of Science. For instance, 33.3 percent of teachers and 28.7 percent of students were of the opinion that the tools and equipments were excellent in respect of facilitating teaching and learning. Again, 53.3 percent of teachers and 42 percent of students indicated that tools and equipment were very good in the teaching and learning of Science. All the laboratory

technicians (100%) found the use of tools and equipment to be good for Science lessons.

The findings in Table 3 are consistent with the observation made by Ossei-Anto (1999) that Science teaching will definitely be better done if the issue of inadequate supply of science equipment and tools is tackled with zeal. He further explained that learning by doing is one of the cardinal principles of teaching and that science

experimentation has put many theories on a sound footing. According to him, a major purpose for including laboratory work was to develop in the student a sense for the nature of Science.

The SRCs had been provided with equipment and tools that could help develop the practical skills of students, which could form a basis for learning in the scientific world. Practical lesson in the SRCs were therefore to arouse the interest and creativity of both students and teachers. The facilitation of tools and equipment in the teaching and learning process also gives precedence to the assertion by Ogunniyi (1983) that there is a general consensus among science educators that laboratory occupies a central role in science instruction. According to him, laboratories provide students with unique opportunities to study abstract concepts and generalizations through the medium of real materials.

As students interact with the learning materials, and with their teachers and classmates, they gradually reinforce their knowledge and develop the basic manipulative skills and attitudes needed for future work in science.

To further assess the importance of the SRCs in respect of their facilitation of the teaching and learning of Science subjects, the study sought the views of respondents on the extent to which the SRCs are used for conducting practical exams by the West African Examination Council (WAEC). This was meant to ascertain whether or not the various Science subjects were evaluated by WAEC using the tools and equipments in the SRCs as such a situation will facilitate in the proper assessment of the various Science subjects taught in the Senior high Schools. The results are presented in Table 4.

Table 4: Use of SRCs by WAEC for conducting external exams

Responses	No. of Trs	%	No. of Lab Techs	%	No. of Stds	%
Always	15	100	3	100	156	100
Not always	0	0	0	0	0	0
Never	0	0	0	0	0	0
Not sure	0	0	0	0	0	0
Total	15	100	3	100	156	100

Source: Field Survey, 2010

From Table 4, the results show that practical examinations were always conducted by WAEC in the SRCs within the Metropolis. Even though the SRCs were not intended primarily for the conduct of WAEC practical examinations, this practice, according to most respondents, was a way of adequately making use of the SRCs within the Metropolis. The tools and equipment in the SRCs obviously made it easy to organize and conduct such examinations. The findings in Table 7 are in line with the assertion made by Ossei-Anto (1999) and the World Bank (2007) that SRCs do not only facilitate the teaching and learning of Science subjects, but also assist very much in the assessment of practical subjects, particularly during external examinations often conducted by independent bodies or organizations.

Conclusions

The main purpose of the study was to investigate if the SRCs in Cape Coast Metropolis serve as teaching centers that create the opportunity for practical work and ICT transfer. Specifically, the study sought to:

1. Ascertain how often the tools and equipment in the SRCs are used
2. Assess if tools and equipment facilitate the teaching and learning of Science subjects.

It was concluded that to a large extent the tools and equipment in the SRCs in the Cape Coast Metropolis facilitate the teaching and learning of Science subjects. The tools and equipments were used by the host schools and sometimes the satellite schools for the teaching and learning

of Science. The fact that the tools and equipment were used to for practical lessons means students are better placed to gain a better appreciation of the various science subjects.

Recommendations

1. SRCs should be established in all SHSs in the country to avoid the problems faced by the satellite schools and the host schools as well.
2. In-service training programmes should be organized for both science teachers and laboratory technicians to enable them handle the tools and equipment effectively.

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