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RESEARCH ARTICLE

# AVAILABILITY AND ADEQUACY OF TEACHING/LEARNING MATERIALS FOR THE IMPLEMENTATION OF COMPULSORY SCIENCE CURRICULUM IN PUBLIC SECONDARY SCHOOLS IN BUKOBA DISTRICT COUNCIL, TANZANIA

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**ABSTRACT**

This study aimed at investigating the availability and adequacy of science teaching/learning resources in public secondary schools in Bukoba District Council (BDC), Tanzania. Researchers considered that availability and adequacy of such resources in public secondary schools was a prerequisite for the implementation of compulsory science curriculum in BDC. The study used convergent parallel mixed method research design. The qualitative part employed phenomenology while the quantitate part used cross-sectional design. The target population involved heads of schools, heads of science department (HoDs), science teachers, students; also, included were parents and a District Education Officer for Secondary Schools (DEOSS). Data were collected using questionnaires, interview guide, and observation schedule. Descriptive statistics such tables and charts were used to analyse quantitative data. Qualitative data were organized into themes and presented in narrative form and direct quotes. The findings indicated that public secondary schools encounter various challenges that negatively affect the implementation of science curriculum. The study concludes that a few teaching/learning resources were adequately available as there were also inadequacy of most of the science teaching/learning materials in some of the public Secondary schools in BDC. The study recommends that School Principals must be fully involved in the budgeting process so as to express concrete estimates which reflect the actual needs of their schools. The Government and the Schools' Management should as quickly as possible address those challenges for effective implementation of science curriculum.



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## INTRODUCTION

Implementing science curriculum requires proper preparation in terms of human resources, texture and non-texture resources, physical resources and monetary resources. The Ministry of Education and Vocational Training in Tanzania, (MoEVT, 2013) set conditions and standards for science facilities in secondary schools in the following terms: "Schools shall be equipped with modern laboratories to cater for science subjects. Audio-visual materials, braille equipment. These shall ensure the development of competences as emphasized in the curriculum" (p. 20). Studies carried out have indicated that in many places, the question of preparedness through provision of required resources is critical for many secondary schools. In their study, Hussain, Adeeb, and Aslam (2011), investigated science curriculum implementation and feedback mechanism at secondary school level in Punjab Pakistan.

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Data were collected from randomly selected 23 curriculum experts in the Ministry of Education, curriculum wing Punjab and Punjab Textbook Board. Research data were statistically treated using percentage and mean score. Then, conclusions and recommendations were formulated. Hussain *et al.* (2011) found out that adequate guidelines and teacher training were not ensured before introducing new science curriculum for secondary schools. Consequently teachers were not able to refine the national science curriculum according to their particular needs and the needs of their students. The findings further revealed that a monitoring system to identify weaknesses of existing curriculum, textual material, teachers' delivery and policy formulation did not functionally exist at the secondary school level in Punjab. Subsequently, feedback for proper evaluation and improvement of existing curricula was not available. Moreover the process of continuous curriculum improvement and continuous curriculum revision was not in practice. The study, went on to reveal that in Punjab experts put much emphasis on one aspect of curriculum i.e., preparing a curriculum document and ignored the other important aspect namely: proper teacher education programs; suitable curriculum monitoring mechanism; appropriate process of curriculum evaluation and exact teachers' role in curriculum development process. The current study collected data from selected public secondary schools because from there, information on the preparedness and implementation of compulsory science curriculum in public secondary schools in Bukoba District Council could be reliably generalized. Muhammad (2017) in his work "Survey of availability, Utilization and maintenance of Biology laboratory equipment and facilities in secondary schools in Sokoto State" presents results of the study conducted to examine the availability, use, and extent of maintenance of laboratory facilities in secondary schools in Sokoto State, Nigeria. The researcher employed descriptive survey design for the study. A sample of 30 Senior Secondary Schools and 30 biology teachers was selected from the population of secondary schools in the state using stratified sampling technique. Four research questions were answered using observation schedule. Findings of the study indicated that most senior secondary schools in Sokoto State have no laboratories and are poorly equipped. Teachers' responses indicated reluctance and inability in conducting practical works using the few available laboratory facilities. Poor maintenance culture was also discovered among biology teachers in Sokoto state. The study recommended that science laboratories should be well equipped with relevant and modern facilities for effective teaching. Teachers should try to improvise using local materials, they should also develop maintenance culture to ensure longer life span of the few available facilities. Thecurrent study used convergent parallel mixed methods design to investigate on the preparedness and implementation of compulsory science curriculum in public secondary schools in Bukoba District Council.

Odera (2011), conducted a study to investigate the use of computers in teaching and learning science in public secondary schools in Kenya. The rationale of the study was to find out if science teachers use computers to help improve the quality of science education. Related literature used in the study revealed that computer use in teaching/learning science subjects helps to improve students' performance. Hence, any effective preparation for science would consider computer skills, computer laboratories and computer availability as a prerequisite. Odera (2011) used descriptive survey design to conduct the study. The location of the study was Kisumu Municipality, Kenya. The target population involved 22 head teachers, 1200students and 44science teachers. Saturated sampling was used to select a sample of 20 head teachers, while purposive sampling was used to select a sample of 20 science teachers. At the same time, simple random sampling was used to select a sample of 400 students. Data was collected by use of questionnaire, document analysis guide and observation schedule. Data analysis involved use of descriptive statistics that included graphics, percentages and frequencies. The findings showed that there was inadequate provision of computers in secondary schools. Very few science teachers used computers in teaching/learning science. The study recommended that Head teachers should purchase more computers and provide adequate facilities such as computer laboratory, and trained manpower. The current research work investigated on the extent to which the supply of teaching/learning materials is adequate for the implementation of compulsory science curriculum in in public secondary schools in Bukoba District Council, Tanzania. The study inquired about computer use among teachers and students not for its own sake, but for assessing the integration of ICT in science education which is the advanced level of preparedness and implementation of science curriculum. Kalolo (2014) carried out a study in Dar Es Salaam and Iringa in Tanzania to explore the improving of the quality of science education in Tanzanian junior secondary schools. The sample of the study consisted of 67 key science education stakeholders namely: educators, policy makers, parents, students, science alumni and selected education officers. In order to address the issue, the study used a mixed method approach involving interviews and questionnaires with all respondents except students); document review, and focus group discussions with students. A pragmatic perspective, with an emphasis on creating a more relevant, contextual, responsive and functional science education experiences in schools, was used as a lens. The study was conducted in two concurrent (embedded) phases within two regions in Tanzania beginning with in-depth interviews with policy makers and followed by intensive study of schools. All phases of data collection generated qualitative and quantitative data sets, which were then analysed using thematic analysis and descriptive statistics respectively.

In his study, Kalolo, (2014) found out that despite policy articulation, the understanding and delivery of quality science education in Tanzanian junior secondary schools has remained debatable, divisive and antagonistic controversy over its meaning, value, nature, features and measures. As such, there are no adequate preparations for the implementation of quality science education. The findings also revealed that there were challenges of preparation even in the process of planning, delivery, assessment and monitoring of science education in secondary schools. Such challenges resulted into limited efforts to provide quality science education. Kalolo (2014), recommended that comprehensive framework is needed to harmonize the existing and diverse conceptions of what quality science education is among different stakeholders. That would make school science education experiences become as relevant, context responsive and functional as possible. The current study, in contrast, was carried out in Bukoba District Council, Tanzania. It involved 260 participants of whom 211 were Form III students, 10 head of schools, 9 science HoDs, 19 science teachers, 10 parents and a District Educational Officer for Secondary Schools. The main objective of this study was to investigate the preparedness and implementation of compulsory science curriculum in selected public secondary schools. To effect this, the study employed mixed method design combining cross-sectional survey and phenomenology to find answers to the research questions.

## MATERIALS AND METHODS

This study employed convergent parallel mixed methods where both quantitative cross sectional survey and qualitative phenomenology research designs were integrated and used concurrently. The researchers converged quantitative and qualitative data to provide a comprehensive analysis of the problem under study (Creswell, 2014). The design further enabled the researchers to collects both forms of data at almost the same time and then integrated the information in the interpretation of the general results. The target groupto which this study sought to generalize its findings in Bukoba District Council consisted of: 1 District education official, 30 public secondary schools, 30 heads of schools, 30 heads of science department, 120 science teachers, 10,348 students, parents who were BoM members. Both probability and non-probability sampling procedures were employed to sample target groups. To ensure proportionality in sampling schools, the researchers used stratified sampling technique to sample schools from the four political divisions of BDC namely: Bugabo, Katerero, Kyamutwara and Rubale. Thus, it was possible to apply the method of proportional allocation which guarantees the presence of key subgroups within the sample thereby warranting reliable and detailed information (Kothari, 2004). Other categories of respondents were sampled as summarised in Table 1 and explained in the following paragraphs. As shown in Table 1, tenheads of school and 10 Heads of Science Department of the sampled schools were automatically included in the study. The study used simple random sampling techniques to select science teachers. From the ten sampled schools, teachers for biology, chemistry and physics in Form III were selected for the study (one teacher for each science subject; three teachers from each selected school). Form III students were purposively sampled to participate in the study because they had ample experience in the school and were at ease to respond to the study's questionnaires. Conscious of gender, researchers used stratified random sampling procedures to sample individual students. In each sampled school, a total number of 26 students from Form III was identified. Half of the number was composed of females and another half of males. Simple random sampling techniques were employed to determine individual participants from each gender group. Eventually, a total number of 211 sampled students was obtained for the study. Ten parents from the BoM of the sampled schools were included in the study. Simple random sampling procedure was used to determine individual parents from the schools' BoM. Purposive sampling technique was used to sample the DEOSS. His role in the planning, supervising and managing education in the area qualified him to be a reliable source of information for the study. He was selected on the basis that he was the only Education Officer for Secondary Schools in BDC.

**Data collection:** Research instruments included questionnaires, interview guides and observation schedule. Questionnaires were used to collect data from students, teachers and HoDs. Interview guides solicited information from Heads of Schools, EOSS and parents. Observation schedule was used by researches to collect data on the availability of science equipment, teaching/learning activities in science classes, and conduciveness of science class environment in order to confirm responses in questionnaires (Gay and Mills, 2015). Validity for qualitative instruments was determined by content validity, source triangulation, method triangulation and pilot testing. Cronbach's Alpha was used to test quantitative instruments' internal consistence reliability. Trustworthiness of qualitative instruments was ensured by: triangulation, rich-thick description and peer review and debriefing. Quantitative data were analysed by SPSS and summarized using descriptive statistics.

## RESULTS AND DISCUSSION

Out of 211 student respondents, 107 equal to 50.7% were males while the rest 104, corresponding to 49.3% were females. Majority of the teachers involved in this study, 78.9% were male while female teachers formed a small section of 21.1%. From the observation, in some of the schools studied, there were very few female teachers among the teaching staff despite the fact that all schools are co-educational. Majority of science teachers, 52.6% are aged between 25-29 years. About 26.3% are aged between 35-39 years and a small fraction of 5.3% are 55 years and above years. Results were presented by tables and charts. Qualitative data were examined and analysed by breaking them into manageable units; looking for patterns among variables to establish accuracy, usefulness and completeness. Findings were discussed and presented in form of narrative and direct quotes by thematic analysis. Key results: some teaching/learning resources were adequately available in some schools. Most of the teaching/learning materials and laboratories were inadequate. Shortage of basic ICT hardware and software for management and for instruction was rampant. The study recommends that the Ministry of Education, Science and Technology constantly update itself on the condition of the schools and address their problems accordingly. Preparation of school budgets should be realistic and must involve heads of schools in order to cater for the actual needs of the schools. School Managements must ensure good conditions for the teachers' basic welfare. The Extent to which teaching/learning Materials are available and adequate for implementing Science Curriculum. This research question aimed at assessing the extent to which teaching/learning materials for science subjects were available. The study sought information from students, teachers, heads of departments, heads of school, parents, and DEOSS on how teaching/learning materials were available and adequate for the implementation of compulsory science curriculum. HoDs, Teachers and Students Responses on Availability and Adequacy of Teaching/Learning Materials for Science Curriculum.The study sought to establish whether science teaching/learning materials were available and adequate for science curriculum. Students, teachers and HoDs had varied views on the availability of teaching/learning materials for science subjects as shown in Table 2.

**Availability of Science Textbooks:** Study findings in Table 2 show that majority of the HoDs 88.9%, science teachers 84.2% and students 93.8% described Biology Textbooks as available. None of the Hods and Teachers rated Biology Textbooks as not available. Only 1.2% of students assessed biology textbooks as not available. Generally, there was a fairly similar and consistent rating by HoDs, science teachers and students on availability of textbooks. For instance, HoDs, science teachers and students evaluated availability of Chemistry textbooks at 77.8%, 84.2% and 62.6 respectively; and Physics Textbooks at 66.7%, 84.2% and 70.1% respectively. Only a small portion of students 5.7% and 3.8% assessed as not available Chemistry and Physics textbooks correspondingly. This small percentage may be referring to students at whose schools there were no chemistry and physics teachers and therefore chemistry and physics books were not regularly used. During the interviews, the researcher asked the heads of schools about the availability of science textbooks according to their respective subjects. All the heads of schools said they were available. The DEOSS on answering the same question stressed that "...we cannot complain. Science textbooks are very much available. Most schools have even more science textbooks than they need" [Interview: 1/12/2017]. The researcher's observation in most schools confirmed the actuality of quantities of science textbooks in stores. This indicates that most schools, as far as availability of science textbooks is concerned, are adequately prepared.

**Availability of Chemicals and Laboratory Equipment:** Chemicals and laboratory equipment constitute an essential requirement for the implementation of a science curriculum.

**Table 1.Sampling Matrix**

| Schools | Total Population (N) | Sample size (n) | Sample % of Total | Sampling Technique |
|---|---|---|---|---|
| Schools | 30 | 10 | 33.3% | Stratified Sampling |
| Head of schools | 30 | 10 | 33.3% | Automatic Inclusion |
| Heads of Department | 30 | 10 | 33.3% | Automatic Inclusion |
| Science Teachers | 120 | 30 | 25.0% | Purposive and Simple Random Sampling |
| Parents | - | 10 | - | Simple Random Sampling |
| Students – Form III | 1,150 | 260 | 22.6% | Simple Random Sampling and Stratified Sampling |
| District Education Director | 1 | 1 | 100.0% | Purposive Sampling |
| Total | 1,331 | 331 | 24.9% | |

**Table 2. Distribution of HoDs, Teachers and Students' Responses according to the availability of textbooks and charts**

| T/L Material | HoDs | | | | Science Teachers | | | | Students | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Available | | Not Available | | Available | | Not Available | | Available | | Not Available | |
| | F | % | F | % | F | % | F | % | F | % | F | % |
| Biology Text Books | 8 | 88.9 | - | - | 16 | 84.2 | - | - | 198 | 93.8 | 3 | 1.2 |
| Chemistry Textbooks | 7 | 77.8 | - | - | 16 | 84.2 | - | - | 132 | 62.6 | 12 | 5.7 |
| Physics Textbooks | 6 | 66.7 | | | 16 | 84.2 | - | | 148 | 70.1 | 8 | 3.8 |
| Science Charts and Diagrams | 2 | 22.2 | 5 | 55.6 | - | - | 18 | 94.7 | 25 | 11.8 | 186 | 88.2 |

**Table 3. Distribution of HoDs, Science Teachers according to the sufficiency of available chemicals and laboratory equipment**

| Chemical/ Laboratory Equipment | HoDs | | | | Science Teachers | | | |
|---|---|---|---|---|---|---|---|---|
| | Sufficient | | Not Sufficient | | Sufficient | | Not Sufficient | |
| | F | % | F | % | F | % | F | % |
| Sulphuric Acid | 4 | 44.4 | 5 | 55.6 | 6 | 31.6 | 10 | 52.6 |
| Sudan III | 2 | 22.2 | 6 | 66.7 | 3 | 15.8 | 12 | 63.2 |
| Benedict's Solution | 5 | 55.6 | 2 | 22.2 | 10 | 52.6 | 6 | 31.6 |
| Bunsen Burners | 3 | 33.3 | 5 | 55.6 | 6 | 31.6 | 10 | 52.6 |
| Voltmeters | 7 | 77.8 | - | - | 9 | 47.4 | 8 | 42.1 |
| Aquarium | 1 | 11.1 | - | - | - | - | - | - |
| Test Tubes | 7 | 77.8 | 2 | 22.2 | 10 | 52.6 | 5 | 26.3 |
| Retort Stands | 2 | 22.2 | 7 | 77.8 | 3 | 15.8 | 12 | 63.2 |

**Table 4. Distribution of HoDs, Science Teachers and students' responses according to the availability of ICT equipment**

| ICT Equipment | HoDs | | | | Teachers | | | | Students | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Available | | Not Available | | Available | | Not Available | | Available | | Not Available | |
| | F | % | F | % | F | % | F | % | F | % | F | % |
| Computers for Office | 2 | 22.2 | 7 | 77.8 | 5 | 26.3 | 14 | 73.7 | 85 | 40.3 | 129 | 61.1 |
| Computers forTeaching | 2 | 22.2 | 7 | 77.8 | 4 | 21.1 | 15 | 78.9 | 39 | 18.5 | 166 | 78.7 |
| Photocopier | 2 | 22.2 | 7 | 77.8 | 8 | 42.1 | 11 | 57.9 | 19 | 9.0 | 126 | 59.7 |
| Satellite Dish & Decoder | 1 | 11.1 | 8 | 88.9 | 4 | 21.1 | 15 | 78.9 | 26 | 12.3 | 177 | 83.9 |
| LCD Projector | 2 | 22.2 | 7 | 77.8 | 4 | 21.1 | 15 | 78.9 | 44 | 20.9 | 160 | 75.8 |
| Overhead Projector | 0 | 0.0 | 9 | 100 | 1 | 5.3 | 17 | 89.5 | 19 | 9.0 | 189 | 89.6 |

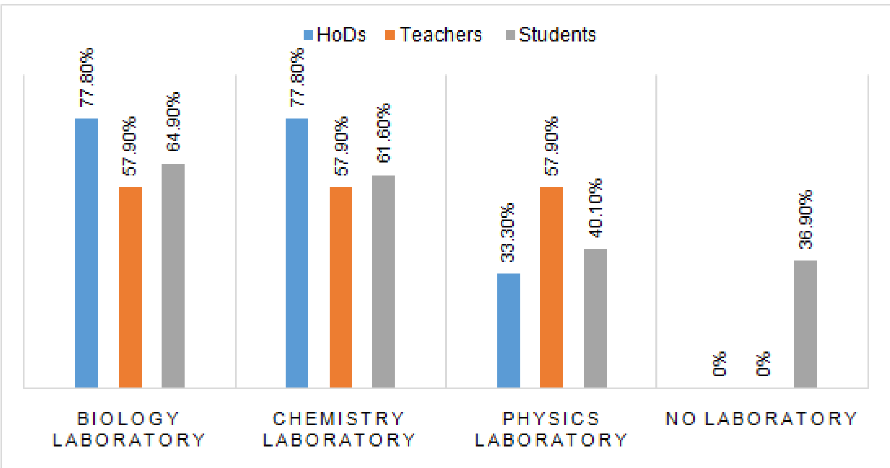


**Figure 1. Distribution of HoDs, Science Teachers and Students according to the availability of Science Laboratories**

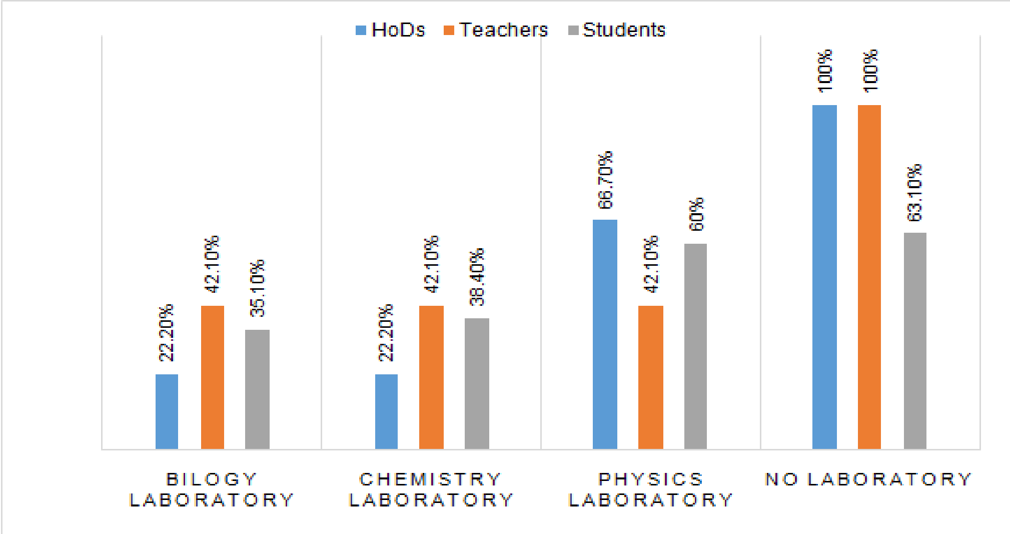


**Figure 2. Distribution of HoDs, Science Teachers and Students according to the Missing Responses on the Availability of Science Laboratories**

Apart from being only available, chemicals and laboratory equipment are expected to be sufficient for the frequent laboratory experiments in the interest of learners. Respondents were required to indicate which of the listed chemicals and laboratory facilities were sufficient or not sufficient at their respective schools. Heads of department and science teachers gave varied answers to this question as summarized in Table 2. Table 3 reveals that majority of HoDs 77.8%, 77.8%, 55.6%, rated Test tubes, Voltmeters and benedict's solution as available and sufficient in their schools respectively. In the meantime, another majority of HoDs, 77.8%, 66.7%, 55.6% and 55.6% evaluated as available but not sufficient the following chemicals and laboratory facilities in their respective order: retort stand, Sudan III, bunsen burner and sulphuric acid. Majority of science teachers 52.6% rated Benedict's solution and test tubesas sufficient. Another majority of teachers described as not available the following chemicals and laboratory equipment with their respective percentages in parentheses: Sudan III (63.2%), retort stands (63.2%), Bunsen burner (52.6%) and Sulphuric acid (52.6). A range of between 10.0% and 15.3% of science teachers did not respond to some specific items on their corresponding questionnaires.

These findings show that some schools had enough chemicals while others had these chemicals in smaller quantities. This is one of the factors that led to conducting few experiments only for Form Four students. In that sense, the Curriculum Implementation Theory was disregarded in as far as it requires adequate availability of resources and provision of management support for any program introduced in a particular school (Gross, Giacquinta, and Bernstein, 1971). For teachers who did not respond to some specific items, there are several assumptions. It might be that they were newly placed because most of the teachers had the experience of 0-4 years at their respective schools. Therefore they were not fully informed about the school's level of preparedness as far as science curriculum was concerned. Hence, at the management level, strict observance of the principles of TQM would require improvement of cooperation among departments because accomplishments in any organization cannot be achieved unless owners and operators of a process are working together (Andi, Rao, and Jeyathilagar, 2009).

When interviewed, most heads of schools responded in the affirmative that chemicals and laboratory apparatus were sufficient for the requirements of the school. It was not easy for most of the heads of schools to tell the details of each individual chemical or laboratory facility. Some referred the matter to the heads of department of the particular subject. However, few heads of schools admitted to run short of the chemicals and laboratory facilities. The District Education Officer for Secondary Schools generally explained that each school purchases chemicals and laboratory equipment as per the capitation grant allocated for that purpose. Majority of the parents who were interviewed were of the view that science materials were lacking in their schools because students were complaining for not conducting experiments. This confirms the findings of Potvin and Hasni (2014) who noted that quality education in science is being hindered by lack of necessary facilities...like laboratories, chemicals and apparatus. Also, a similar scenario was reported by Mahita and Semali, (2015) where many laboratories in their locale of study run short of essential equipment. Additionally, this deviates from one of TQM tenets which maintains that TQM involves long term dedication to improving quality and active participation of all members at all levels to meet and exceed customers' expectation (Deming, 1982).

**Availability of ICT Equipment:** The teaching of science in the modern world is very much facilitated with ICT. The respondents were required to answer whether ICT facilities were available or not available for the effective teaching of science at their respective schools. The HoDs, science teachers and students had varied views on this question. Table 12 summarises the results. Findings shown in Table 4, reveal that majority of HoDs, with the actual percentage in brackets, rated as not available the following ICT gadgets: computer for office use (77.8%), computer for teaching (77.8%), photocopier (77.8%), satellite dish and decoder (88.9%), LCD projector (77.8%) and overhead projector (100%). The same gadgets were assessed as not available by teachers and students in the following respective order and bracketed percentage: computers for office use (73.7%; 61.1%), computers for teaching (78.9%; 78.7%), photocopier (57.9%; 59.7%), satellite dish and decoder (78.9%; 83.9%), LCD projector (78.9%; 75.8%) and overhead projector (89.5%; 89.6%).

The same ICT facilities were described as available in some schools by a small section of respondents. As shown in Table 4, 22.2% of HoDs, 26.3% of teachers and 40.3% of students said that computers for office use are available in their schools. On the other hand, 22.2% of HoDs, 21.1% of teachers and 18.5% of students alleged that their schools have computers for teaching. As regards photocopiers, 22.2% of HoDs, 42.1% of teachers and 18.5% of students said they are available at their respective schools. Satellite dish and decoders were available according to 11.1% of HoDs, 21.1% of teachers and 12.3% of students whereas LCD projectors were rated available by 22.2% of HoDs; 21.1% of teachers and 20.9% of students. None of the HoDs rated the overhead projector as available while for 5.3% of teachers and 9.0% of students it was available. These findings corresponded to the answers given during the interviews. Many heads of schools admitted their schools were not equipped with ICT facilities. Different expressions were used by heads of schools to describe this phenomenon: “We don’t have any ICT facility” [Interview: 23/11/2017]; “We have no such facilities at our school” [Interview: 28/11/2017]; “The school does not have any ICT facility to use for teaching science” [4/12/2017]; “ICT facilities are neither available nor used at our school” [4/12/2018]. Various reasons, for not having or using ICT facilities, were put forward by heads of schools including lack of electricity, internet connectivity and lack of enough funds from the government. One head of school said “It is not easy to operate computers, photocopiers and projectors in a school where there is no electricity. Without electricity, what is office computer for? It will only rot in the office.” [Interview: 23/11/2017]. One head of school hinted on the challenge their creativity faces in this regard: “By using our phones we get information from the internet and use it to teach our students. However, that depends on the availability of the network in the area” [Interview: 27/11/2017]. In another school, meagre ICT facilities, lack of laboratories and short of teachers who could operate them constituted a hindrance to their usage: “The school has got some computers and two projectors but we lack conducive rooms for computer labs. This situation hinders the use of ICT in teaching/learning science at this school” [Interview: 27/11/2017].

The DEOSS describing the extent to which ICT facilities were available and the frequency of their use in schools he said that the Government is supportive for the use of ICT in the teaching of science. “Although it cannot totally guarantee the funds but it encourages educational stakeholders to assist institutions in realizing this deal. On its part, through projects like Rural Electrification Authority (REA), the Government is working hard to supply electricity to rural areas. In such projects even our schools are beneficiaries.”[Interview: 1/12/2017]. These findings, however, deviate from the Tanzania Development Vision 2025 which emphasizes on the importance of curriculum transformation with a focus on promoting quality science and technology at all levels of education and making ICT accessible to all (URT, 1999). Furthermore, the findings indicate how far both students and teachers are deprived of the opportunity of using ICT to facilitate their understanding of science concepts significantly.

**Availability of Laboratories:** The importance of laboratories in science education cannot be underestimated. Science experiments and science laboratory equipment aid in developing scientific learning amongst students, and in cultivating deeper and profound interest in the field. Experiments conducted in the laboratory give to the learner a first-hand experience in observation and manipulation of the materials of science which in turn develop their skills necessary for more advanced study or research (Hussein *et al.,* 2011). Hence, the study sought to know whether there were well equipped laboratories for science subjects at each sampled school. Further, the study wanted to know the frequency of experiments conducted with regard to science subjects. There were varied responses given by HoDs, science teachers and students as summarized in Figure 1 and Figure 2: Figure 1 reveals that 77.8% of HoDs, 57.9% of science teachers and 64.9% of students assessed biology laboratories as available in their respective schools. Also, 77.8% of HoDs, 57.8% of science teachers and 61.6% of students rated chemistry laboratories as available in their institutions. About 33.3% of HoDs, 57.9% of science teachers and 36.9% of students rated physics laboratory as available in their corresponding schools. Only 36.9% of students rated their schools as having no laboratory at all. Figure 2 shows the missing percentage, as per category of respondents, with regard to the availability of science laboratories. The findings show that 22.2% of HoDs, 42.1% of teachers and 35.1% of students did not indicate whether biology laboratories were available in their particular schools. Similarly, about 22.2% of HoDs, 42.1% of teachers and 38.4% of students kept quiet about the availability of chemistry laboratories in their schools. Approximately 66.7% of HoDs, 42.1% of science teachers and 60% of students were indefinite about the availability of physics laboratories in their specific schools. None of the HoDs (100%) and none of science teachers (100%) rated their schools as having no science laboratory at all. Only 63.1% of students did not rate their schools as having no laboratory. Indeed the situation suggests what Ngwega (2016) observed, a distorted educational sector which calls for immediate reform by supplying enough science teachers, modern laboratory facilities..."

Responses given in interviews were not much different from the questionnaire responses. Out of ten heads of schools who were interviewed, four admitted their schools had no laboratories at all; four demanded laboratories were not enough and two asserted their laboratories were incomplete. “Unfortunately, we don’t have laboratories at our school” said one head of school [Interview: 24/11/2017]. A similar assertion was made by another head of school “We have no laboratories. We use classrooms instead of Laboratories” [Interview: 23/11/2017]. Four heads of schools told the researcher that their schools had no enough laboratories. “We have sufficient apparatus and science equipment. However, laboratories are not enough. We have one room for all three laboratories – Biology, Chemistry and Physics” (Interview: November 23, 2017). “Only one Laboratory is complete. Hence, laboratories are not enough” admitted one head of school. (Interviewed: November 27, 2017). Other heads of schools pointed to the problem of incompleteness of laboratories. Heads of schools F and H, in the interviews done on November 23, 2017, described their laboratories to be sufficient to a certain percentage: “Science laboratories (Biology, Chemistry, and Physics) are sufficient for about 80%”. Another one noted, “I can say, laboratories are sufficient by 90%”. The DEOSS, in the interview acknowledged the challenges embedded in the availability and usability of laboratories. Yes, there is a big challenge of shortage of laboratories. However, since the last twelve years, the Government has been encouraging the school community and indeed all educational stakeholders to take active part in constructing laboratories at every secondary school. Many have managed to alleviate this problem to a greater extent. Only a few are still struggling but the Government does not leave them alone. Donors and sponsor, at the invitation of the Government, have aided (and are still aiding) some of our schools to construct laboratories and supply them with needed equipment. We are optimistic for a better future (Interview: December 1, 2017). These findings reveal that there is total lack or incompleteness of science laboratories in public secondary schools in BDC. This however, diverges from the call of the Government of the Republic of Tanzania of all secondary schools to have modern and full equipped laboratories to ensure development of learners' competences intended by science curriculum (MoEVT, 2013).

**Conclusion and Recommendations**

Science resources that were most available and sufficient in schools included. Text Books for science subjects: Biology, Chemistry and Physics for all classes. Also, most of the laboratory chemicals, science equipment and facilities were available in most schools. The science resources with least availability and low usage included the aquarium, animal cage, voltmeters, retort stands and science charts and diagrams.The ICT equipment which was rated as available in some schools included office computers, printers and photocopier. On the other hand, ICT hardware which was rated as not available and never used included LCD projector, satellite dish and decoder, overhead projector, television and video decoder/player (VHS). The average number of available laboratories per school and frequency of experiments was generally low. Most schools had only one room used for all three science laboratories. This makes it difficult for learners to differentiate one laboratory from the other. The frequency of experiments was also very low. Most experiments were conducted for Form IV class as the national examination approached. This deprives the learners the possibility of adequately comprehending the objectives and procedures of experiments as they are performed at a critical moment when the pressure for the examination is already very high. Consequently experiments are subjected to memorization diverting them from their original purpose of giving to students a hands-on application as per topic taught in science classes. The Government through the Ministries of Education Science and Technology (MoEST) and that of the President's Office, Regional Administration and Local Governments (PORALG) should consider empowering the stakeholders on the relevance of compulsory science education. The Heads of School and HoDs should be encouraged and empowered to be innovative. Let them take initiatives to involve school communities to support schools in their endeavour to enhance science education. This can be effected through partnership programs such as parenting, volunteering and decision making. Last but not least, let reparations of school budgets be realistic and involve heads of schools in order to cater for the actual needs of the schools.

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