Assessment of Teaching and Learning Environment for Science Subjects in Secondary Schools in Mkuranga District, Tanzania

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ABSTRACT

The learning environment in schools is vital to students' success and students' academic achievement. Inequalities in learning environments in schools result in inequalities of learning outcome, in both participation and pass rates especially in science and mathematics subjects. The study assessed teaching and learning environment for science subjects in secondary schools. The study adopted a cross - sectional design and both quantitative and qualitative approaches were used. Probability sampling technique, simple random and purposive sampling were used to select the respondents. The total sample size was 227 respondents. Structured questionnaire, in depth interview, non-participant observation, and documentary review methods were used to collect data. Quantitative data were analysed through SPSS while content analysis was used for qualitative data. The study findings show that physical facilities were adequate except for classrooms, library, and ICT facilities. Sanitation facilities were available and adequate. The number of Science teachers was inadequate and performance in Mathematics was poor. There was a tendency for students not to opt for science subjects. The study concluded that there were inadequacies in teaching and learning environment that affect learner's academic achievement. The government and Non-State actors should collaborate to equip schools with basic and modern facilities and address the shortage of Science teachers for better teaching and learning outcomes. Heads of School and District educational authority should ensure effective implementation of the strategies targeted to increase learners' positive attitude towards mathematics and science subjects.

Keywords: *Learning environment, academic achievement, secondary school, Tanzania*

1. INTRODUCTION

The learning environment in schools is vital to student success and students' academic achievement. Inequalities in learning environments in schools also result in inequalities of learning outcome, in both participation and pass rates especially in

science and mathematics subjects (The World Bank, 2019). Learning environment involves human resource (pupils and teachers), mental circumstances (mutual relations), and the surrounding environment (school premises, their arrangement, and methodology in the provision of teaching and learning. It is an organized set of physical, social, and informative conditions in which pupils form and implement knowledge, skills, and attitudes to their surroundings (Anderson, 2017).

There is a direct link between the physical environments in which learners are taught/ where teaching occurs and student learning outcomes. A suitable learning environment allows students to feel comfortable and confident as learners. It also improves readiness to learn resulting in few dropouts. Hence, students can work hard and have high achievement levels. In addition, a poor learning environment affects students and the learning process in many ways, such as low student achievement, poor behaviour, student anxiety, and depression (Mutlu and Yildirim, 2019). It also contributes to students' irregular attendance and dropping out of school, teachers' absenteeism, and the teacher and student inability to engage in teaching and learning processes. Inadequate School Water, Sanitation and hygiene (SWASH) facilities as part of learning environment also contribute to dropout and poor school attendance among girls (World Bank, 2019; MoEST, 2016a).

The UN Committee on the Right of the child shows that the quality of the learning environment, teaching and learning process, materials, and learning outputs are important for good performance among students. In addition, sustainable learning environment allows educators and learners to integrate learning principles into their daily practices and facilitate capacity building and competency development (Human Right Watch, 2017; UNESCO, 2017). Moreover, learners' academic achievement is connected with the learning needs of the child within the learning environment. It also depends on the child's circumstances and situations including the quality of schools, teachers, and other factors such as learning materials, support for learning, and the physical surroundings (McGiboney, 2016). According to Tian and Sun (2018, p. 3), academic achievement refers to students' learning outcome of school curriculum. It is a crucial indicator of education quality. In this study, academic achievement refers to students' performance in academic subjects as measured by achievement tests and examinations.

Tanzania is committed to making efforts and mobilising resources in the development of post- primary education training. Thus, Secondary Education Development Programme (SEDP) targeted to improve teaching and learning in secondary schools

(URT 2010). According to MoEST (2016b), SEDP implementation led to an increase of 22percent of teachers in secondary schools. In addition, pupil teacher ratio improved to 17:1. The standard pupil/latrine ratio is 1:20 and 1:25 for girls and boys respectively. Likewise, the Education Sector Plan targeted to ensure availability of sufficient schools, classrooms and teachers (URT, 2018). However, only nine percent of the population aged 15 years and above completed upper secondary education. In addition, about one million of the youth who enter the labour market have low levels of education and skills (The World Bank, 2019; URT, 2010).

According to URT (2017), the enrolment in secondary school (Form I-IV) in Mkuranga District in the year 2016-2017 was 11,047. NECTA (2018) shows further that majority of students who sat for Mathematics examinations in secondary schools failed in that subject, which is compulsory. Examinations results show that less than ten percent of students passed in Mathematics subject. In addition, only a few students opted and sat for Physics and Chemistry National examinations. Performance in Mathematics and science subjects in the National Examinations is a serious problem in secondary schools in Mkuranga District in Pwani Region.

Therefore, this study was required to see how teaching and learning environment could be improved and academic achievement and education quality could be boosted. In this regard, the study assessed the learning environment of science subjects in secondary schools in Mkuranga District Tanzania. The specific objectives of the study were first to examine teaching and learning of science subjects in secondary schools. Secondly, to assess physical facilities for teaching and learning; and thirdly to examine the availability human resource for teaching and learning of science subjects (teachers and supporting staff, students, parents and community members). The study assumes that learning environment affects learners' achievement in secondary schools in Mkuranga District.

The study responds to UNESCO Sustainable Development Goals (SDGs) specifically goal number four which focuses on quality education for all, and the United Nations initiative which sets a target for all countries to offer free, equitable, and quality primary and secondary education to all children by 2030 (UNESCO, 2017). This study is therefore important as it helps the Government of Tanzania through the Ministry of education of Science and Technology to be more responsive in improving learning environment in secondary schools. The study contributes to the implementation of Tanzania's Education and Training policy 2014 that aims at increasing access to primary and secondary education, and improving the quality of education (URT, 2014).

The study also contributes to the understanding of teaching and learning environment for science subjects in the study area and other similar settings through exploration of physical facilities and human resource. The outputs of this study therefore, would help in improving learning environment and students' performance in secondary schools. The study also contributes in the making of rational policies and decisions in relation to the learning environment in secondary schools.

Guided by Bronfenbrenner ecological theory, the study focuses on the individual (learner), the process (teaching and learning), and the environment (school environment). The study explains learning environment and the structures with which learners had direct relationships and interactions. The interaction within and across the structures influences teaching and learning process, and students' experience. The structures involve the classrooms as the immediate environment in which learners operate (micro system) and the connection between the learners' home and school (meso system). It also involves an environment in which the learners are directly involved but external to their experience (exo system) such as school community and societal values and practices (Darling, 2007). As Bronfenbrenner argues, individual characteristics, the learning process, and the environment can predict academic performance. In addition, adequate learning resources promote positive learning outcomes. In addition, children problems are both more prevalent and more severe in poor quality environments (Darling, 2007). Therefore, the theory help to understand students' learning environment and to establish quality-learning environment.

2. METHODOLOGY

The study was conducted at Kimanzichana and Mkuranga Wards. The population in Mkuranga District is 222,921 where males were 108,024 and females were 114,897. The population in Kimanzichana Ward is 17,846 where 8,301 were males and 9,545 were females (URT, 2012). In addition, the average household size is 4.5. The population in Mkuranga ward is 25,847 where 12,256 were males and 13,591 were females. The household size is 4.4 (URT, 2012).

The study adopted a cross sectional design, which allows to identify and to pick respondents from different socio demographic across the life span (Privitera and Alhgrim-Dezz 2018). The study used both quantitative and qualitative approaches. Questionnaire, non-participant observation, in depth interview and documentary review methods were used to collect primary and secondary data for triangulation

purposes. The study targeted secondary school students and teachers. Other informants were Heads of school, Educational Officials, and parents. Participation of both male and female respondents was observed. Teachers and students were involved in the study because they are key participants in teaching and learning process. Teachers play a key role in facilitating learning in accordance to the curriculum. Heads of school and educational Officials were involved in the study as they are responsible for ensuring that teaching and learning process is conducted effectively and efficiently. Parents were also involved as stakeholders in the education sector.

The total sample size for this study was 227 respondents. The schools involved in the study were selected purposively based on their location and accessibility. The study used probability sampling technique and simple random sampling to select students, teachers, and parents. The probability sampling technique reduces bias and every participant has equal chance of participating in the study (Privitera and Alhgrim-Dezz, 2018). Heads of school and Educational Officials were selected though purposeful sampling.

The study used non-parametric data and both qualitative and quantitative data were used in order to ensure validity of the study. Quantitative data were analysed using Statistical Package for Social Sciences. Qualitative data were analysed through content analysis. Descriptive statistics were used to summarize the results. Quantitative data were presented and interpreted using cross tabulation, frequency tables, pie, and bar charts. Qualitative data were coded according to key themes and study objectives. Qualitative data provided description and understanding of teaching and learning environment in secondary schools.

FINDINGS AND DISCUSSIONS

Socio Demographic Characteristics of the Respondents

Socio-demographic characteristics of the respondents are presented based on age, sex, education level, marital status, and occupation as indicated in Table 1. The results revealed that more than a half (66.1%) of the respondents were aged between 15 and 24 years. Also less than twenty percent of the respondents aged between 25 and 39 and between 40 - 59 years respectively. Regarding sex, participation of male and female respondents was nearly equal (49.3 and 50.7 percent respectively). More than a half (69.6 %) of the respondents were single while less than a half (30%) were married. In addition, were few (0.4 %) of the respondents were divorced/separated

The results show that more than a half (69.2%) of the respondents had secondary school education while less than twenty percent (16.7%) had university degree. In addition, 7.9, and 6.2 percent of the respondents) r had primary school and diploma education respectively.The level of education implies that the respondents were aware with the teaching and environment in the study area. As for the occupation of the respondents, the results show that, 66.1 percent were students, 18.5 percent were teachers, 11 and 4.4 percent were parents and heads of school and Educational Officials respectively.

Table1: *Demographic Characteristics of Respondents (n= 227)*

Demographic	Characteristics	N	%
Age	15 – 24	150	66.1
	25 – 39	34	14.9
	40 – 59	43	19
Sex	Male	112	49.3
	Female	115	50.7
Education level	Primary School	18	7.9
	Secondary Education	157	69.2
	Diploma Education	14	6.2
	University	38	16.7
Marital Status	Single	158	69.6
	Married	68	30
	Divorced /Separated	1	0.4
Occupation	Students	150	66.1
	Teachers	42	18.5
	Heads of Schools and Educational Officials	10	4.4
	Parents	25	11.0

Teaching and Learning Environment

Teaching and Learning in Schools

The study intended to find out whether there were subjects, which were not taught. The results show that 71 percent of the subjects were taught according to school timetable. However, the finding show that there were science subjects that

were not taught as reported by 29 percent of the respondents. This suggests that the number of Science teachers is inadequate in the study area. Figure: 1 shows the results.

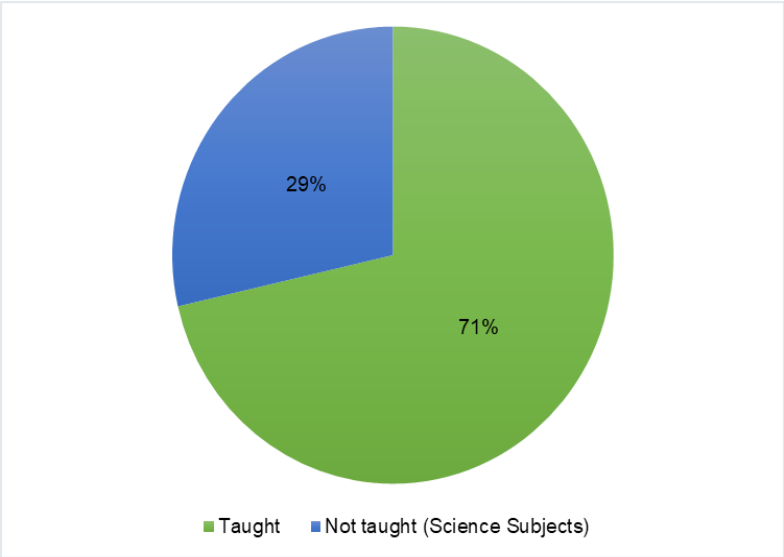

Figure 1: *Classroom Teaching*

These results suggest further that inadequate number of Science teachers contribute to poor performance and the tendency for students not opting for science subjects. Based on NECTA results for the year 2018 and 2019, few students opted for science subjects in secondary schools in Mkuranga. In addition, examination performance for Mathematics subject was worse for most students (NECTA, 2018; NECTA, 2019). Similar results are reported in a study conducted in where students were reported to perform poorly in Mathematics (Ramadhani, 2012). These results show therefore, that teachers play crucial role in students' achievement.

The study also explored the reasons for some subjects not being taught. Various reasons were given as presented in Figure 2

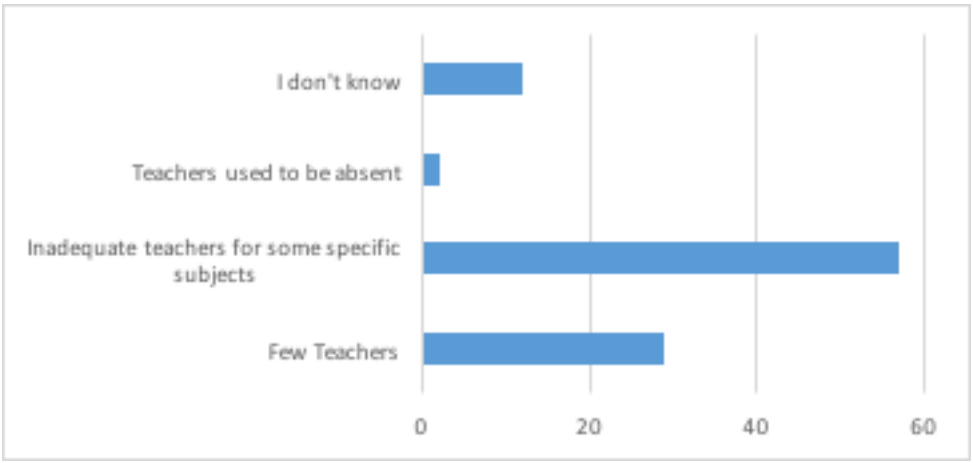

Figure 2: *Reasons given for not taught Subjects*

The results show that more than a half (57%) of the respondents cited inadequacy of teachers for physics and chemistry subjects as a reason. The findings also show that, 29 percent of the respondents reported that Physics teachers were few in their schools. This has implication in teaching and learning process as it affects effective implementation of the curriculum hence poor performance among students. It is important to have sufficient number of teachers for school to implement the curriculum and thus improve the overall quality of education (UNESCO, 2016). In addition, less than five percent (2%) of teachers were reported being absent from school due to either social problems or sickness. Furthermore, other studies (e.g. Ngussa and Mbuti 2017) cited teachers' teaching strategy as a reason for poor performance among students.

Physical Facilities

Classrooms Facilities

The respondents were required to rank the facilities in three categories, namely Adequate, Inadequate, and not applicable. The study results show classrooms were reported to be inadequate (54.2%). in some schools, chairs and tables were put in open spaces within the school compound and tests were taken outside the classrooms. This suggests that there is a challenge during administering of tests and examinations. Table 2 presents the results.

Table: 2 *Classrooms Facilities (n=192)*

	RANKING		
Type of facility	**Adequate**	**Inadequate**	**Not Applicable**
Desks	168(87.5)	24(12.5)	0(0)
Tables and Chairs	98(51.0)	94 (49.0)	0(0)
Blackboards	189(98.4)	3(1.6)	0(0)
Classrooms	88 (45.8)	122 (54.2)	0(0)
Computers and projectors	0(0)	6(3.1)	186(96.9)

The study findings show further that, 51percent of the respondents cited chairs and tables as being adequate. Likewise, 87.5 percent of the respondents cited desks as being adequate in the sampled schools. However, 3.1 percent cited computers and projectors as being inadequate. Other scholars cited physical characteristics of learning environment as affecting students cognitively, emotionally, and behaviour wise. The effect of physical learning environment can vary among learners and the learning activities. Moreover, most students do not feel comfortable in the classrooms that are not suitable for learning. Physical aspects in a classroom involve all physical objects present in the classroom such as blackboard, furniture, lightning, projector, and computers (Malik and Rizvi, 2018).

Library Facility

The findings show that 45 percent of the respondents reported that, there was no library in their school. It was also found through physical visit of the school premises that books were kept in special rooms. These results suggest that learners do not have a place for further reading or for obtaining references materials for various assignments. Figure 3 provides the details.

A study conducted in Morogoro Municipality also showed that, 20.3 percent of schools had no school library (Bernard and Dulle, 2014). Thus, based on other studies, the situation seems to be worse in Mkuranga, Pwani compared to Morogoro. School libraries are important, as they are a source of different information resources. They also improve teacher effectiveness (Bhatt, 2013; Semali, 2014).

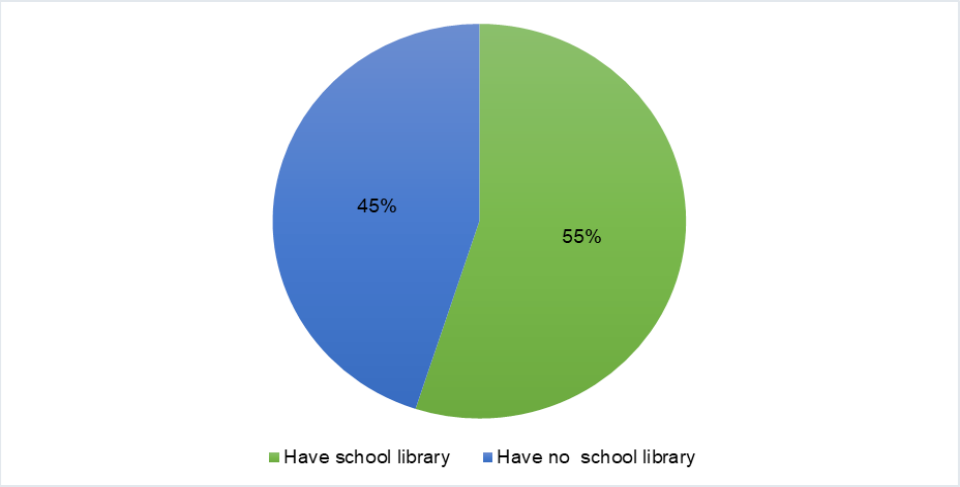

Figure 3: *Library Facilities*

Availability of Books

The findings show that textbooks for teachers and students were not adequate as reported by 58.8 percent of the respondents. This suggests that teachers and learners experience challenges during teaching and learning process. Table 3 provides the details as reported by teachers and students.

Table 3: *Books Availability in School Library (n=192)*

Number of Books	n	%
Very few (0 -10)	10	5.2
Enough to fill one shelf (11 -25)	19	10
Enough to fill book case (26 -100)	30	15.6
Enough to fill two book cases (101 -200)	113	58.8
Enough to fill three or more book case s (200+)	20	10.4
Total	**192**	**100.0**

The study results are in line with the results of other studies for example, the textbook survey conducted in Lindi, Morogoro, and Dodoma regions showed that the number of textbooks, which were used in secondary schools was small (Barret, Mtana, Osaki and Rubagumya, 2014). Furthermore, most Form 1 teachers relied on one or two textbooks. In addition, the survey showed that for most students in the sample schools, books were not available or only available when shared with several other students. The situation was worse in Lindi region compared to other regions where students did not have textbooks at all (Barret, et.al 2014). Elsewhere,

Dangara (2016) found that the quality and quantity of educational resources contributes to effectiveness and efficient in teaching and learning process.

Sanitation Facilities

The findings show that more than a half (74%) of the respondents reported that water supply facilities, and 87.5 percent reported that pits and waste collection were good. Table 4 presents the results.

Table 4: *SWASH Facilities Ranking by Teachers and Students (n=192)*

Type of facility	RANKING		
	Good	Fair	Not Applicable
Water Supply facilities	142(74)	58 (26)	0(0)
Latrine facilities	108 (56.2)	84 (43.8)	0 (0)
Hand washing facilities	101 (52.6)	89 (46.4)	2 (1.0)
Pits and other waste collection	168 (87.5)	24 (12.5)	0 (0)

In addition, 56.2 and 52.6 percent of the respondents reported that latrine and hand washing facilities respectively were good. These results suggest that school water, sanitation and hygiene (SWASH) facilities were available and adequate. Availability of sanitation facilities improves the learning environment, attendance, and achievement. Sanitation is one of the reasons for school dropout in developing countries (UNESCO, 2016). Other studies also found that the overall implementation of sanitation campaign in schools was effective. In addition, access to adequate SWASH facilities contribute to improved health and education of children (Antwi-Agyei *et al.,* 2017).

Human Resource

Teachers and Students

The results obtained through interview with heads of school and Educational Officials showed that, the number of teachers is inadequate in science subjects. Similar results were reported by 29 percent of teachers and students as shown in Figure1. However, URT (2017) shows that there were 498 qualified teachers in government secondary schools while the number was 234 in private secondary schools in Mkuranga District. In addition, the overall PTR (Pupil Teacher Ratio)

was 14.1. Hence, inadequacy of teacher suggests a need for careful attention on teachers' availability since student – teacher interaction helps students to have self-confidence, self-esteem, and self-assurance in dealing with Mathematics or science subjects. Teachers can also encourage their students to take the responsibility of their own learning (Sigh et al. 2019).

Parents and Community Members

Parents and community members are among the human resource in the school system (Dangara, 2016). The study findings show that parents used to visit the schools and had discussions with heads of the school regarding educational related issues of their children. For example, a female parent aged 45 years had this to say:

> *"My child who is in Form four had not been to school for two weeks now. She told me that, she is going to visit her Aunt in the nearby village during weekend but she never come back… I noted later that she did not even go to her Aunt …"* (April 2018).

The finding suggests that there were dropout cases among students especially among girls. Hence, parents should provide feedback to school on the observed changes in their children's behaviour, skills, and knowledge. Parents also have the responsibility of attending parent-teacher meetings or participate in school committees or boards to discuss school issues including school performance in test and examinations, school resources, infrastructure and finances. A male parent aged 49 years had this to say,

> *"We are involved in various school activities… I did not manage to attend all but I attended parent meetings and discussions with Class teachers…"* (April 2018).

Moreover, other scholars (e.g. Neaum, 2016; Nyamubi, 2019) found that parental involvement in their children education have positive impacts on children's development. They (parents) provide stable and secure environment, parent - child discussion and guidance. In addition, parent's encouragement, material, and moral support to their children enhance students' performance.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The results of this study show that physical facilities were adequate in the sampled schools except for classrooms, library, and ICT facilities. Moreover, sanitation facilities were available and adequate. The findings show that the number of Science teachers was inadequate and performance in Mathematics was poor. Moreover, there was a tendency for students not to opt for science subjects. This was attributed to deficiencies in teaching and learning environment in secondary schools.

Recommendations

The study recommends for the improvement of teaching and learning environment. The government and Non-State actors should collaborate to equip schools with basic and modern facilities and to address the shortage of Science teachers for better teaching and learning outcomes. Heads of School and District educational authorities should ensure effective implementation of school strategies in order to increase learners' positive attitude towards science subjects in general and Mathematics in particular.

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