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An assessment of the teaching classroom spaces in public senior secondary schools in Bo city, Sierra Leone

[1] Augustine Sondai, [2] Peter Mboh Muffuh, [3] Dr. Joseph BA Kandeh, [4] Tom Gibao Lahai

[1] Department of Mathematics and Integrated Science, Bo Campus, Njala University, Sierra Leone
[2] Institute of Languages and Cultural Studies (INSLACS), Bo Campus, Njala University, Sierra Leone
[3, 4] Department of Agriculture and Home Economics Education, Njala University, Sierra Leone

Abstract
The study assessed the teaching classroom spaces in senior secondary schools in Bo city. The study made use of the survey design. Quantitative data collection method was employed. The population comprised all teaching classrooms, all students in the senior secondary schools in Bo city during the 2015/2016 academic year. One hundred and forty three (143) teaching classrooms and the student roll for the 2015/2016 academic year in each of the six sampled public senior secondary schools in Bo city comprised the sample. Purposive sampling technique was used to select the six senior secondary schools. The dimensions of the teaching classroom floor spaces of the six sampled senior secondary schools were measured and the number of students each classroom can ideally accommodate computed. This data was compared with the roll of each class. The research revealed that with the exception of Government senior secondary school, Bo, the classroom floor spaces available in the other sampled public senior secondary schools in Bo city were found to be overcrowded. The administrators admitted far more students than their schools can ideally accommodate. Also, the study revealed that the majority of the sampled public senior secondary schools have low ceiling, poor ventilation, uncomfortable temperature, noisy locations, and all the classrooms have row layout.

Keywords: teaching space, physical capacity, physical classroom environment

Introduction

Background to the Study

Classrooms are found in educational institutions of many kinds, from preschools to universities, and may also be found in other places where education or training is provided, such as corporations, religious and humanitarian organizations. The classroom attempts to provide a space where learning can take place uninterrupted by outside distractions (Grubaugh and Houston, 1990) [1]. Adequate classroom spaces are necessary as they allow the teacher and students to interact with the environment without conflicting with each other.

Senior secondary schools in Sierra Leonean cities have experienced large increases in population and have needed to build new schools, expand existing ones, or put more students in buildings than the buildings are designed to serve.

Although various measures have been adopted to improve on the quality of teaching in senior secondary schools in Sierra Leone especially in the area of improving on the teacher/pupil ratio, no formal step has been taken to investigate the number of pupils that each school should ideally accommodate. Assessing teaching classroom spaces will provide a realistic and fair way of assessing the number of students the senior secondary schools can ideally accommodate. It is imperative that the teaching classroom spaces be given some consideration for inclusive education. The implication is that opening up school buildings to the wider community especially with the provision of a conducive physical environment plays an important role in the inclusion of children with special educational needs and disabilities.

Temple (2007) [2] and Higgins *et al.* (2005) [3] refer to a number of sources that describe the ways in which specific environmental conditions impact upon student learning. The environmental conditions described are factors such as noise, temperature, air quality, ventilation and lighting (Keep 2002 [4]; Higgins *et al.* 2005 [3]; Sundstrom 1987 [5]; McNamara & Waugh 1993 [6]; Weinstein 1979 [7]). Generally, these conditions are considered as basic yet optimal conditions in which students are best able to perform.

Research Problem

Teaching spaces seems to be one of the challenges to teaching and learning in Sierra Leonean public senior secondary schools. Teaching spaces comprise all rooms available for teaching or learning, including all timetabled spaces, halls, libraries and study areas but not including dining areas or social areas. Since the end of the civil strife in Sierra Leone in 2002 to 2015, principals reported high senior secondary school enrollment in Bo city without a corresponding report on increase in the provision of teaching classrooms. However, no study has been conducted so far at district or regional level to investigate the teaching classroom spaces in senior secondary schools in Bo city. The Ministry of Education Science and Technology (MEST) pressures schools to maintain teacher/pupil ratio of 1:45 without making reference to the size of the teaching classrooms.

Also, strong and consistent evidence exist for the effect of basic physical variables such as temperature, noise, type of ceiling, lighting, furniture, seating arrangement and air quality on the academic performance of students. However, the levels to which these factors are addressed in the sampled schools are yet to be investigated.

It is against the background of lack of current information on the extent of the match between the enrolment and teaching spaces in the senior secondary schools in Bo city that this study was tailored to respond to the following research questions.

Research Questions

- What limitations are obvious in the physical classroom environments which impinge on the space availability for the learner's interactive mobility in the senior secondary schools?
- What are the implications engendered from the spacing facilities in the classroom?
- What physical facilities are available in the classroom environment at appropriate or ideal level?

Purpose of the Research

The purpose of this research is to present current information on the extent of the match between the enrolment and Learning Spaces in the senior secondary schools in Bo city.

Significance of the Study

All public senior secondary schools in Bo city have experienced large increases in population and have needed to put up new buildings, expand existing ones, or put more students in buildings than the buildings are designed to serve. Also, public senior secondary school administrators do not seem to have an idea of how physical capacities of classrooms are computed. This work will serve as a guide for future classroom constructions and the remodeling of the spaces available in the already existing teaching classrooms so that they may be used more effectively.

Calculating the number of students the teaching classroom spaces in senior secondary schools in Bo city can ideally accommodate will also help students with special educational needs (SEN) that are admitted and are taught alongside others without such needs that require mobility or other equipment which occupies significant space. In inclusive classrooms, children with and without disabilities are expected to learn to read, write and learn academic skills.

If net capacity is computed and compared with number on roll it can indicate the number of places that are surplus or additional places that may be needed in the schools. This will help Ministry of Education Science and Technology officials and the school board members to monitor surplus capacity of senior secondary schools since the capacity of a school is the number of students it can accommodate each school year. It can also help school administrators to plan school spaces.

Institutions need to have among their resource materials, such a useful research product, which could be used to upgrade their knowledge in the area of study and as a result create more room for further research.

Delimitation of the Study

The study was limited to the selected senior secondary schools in Bo city, southern province of Sierra Leone. Bo city was selected for the study because it is in these towns that we have high concentration of senior secondary schools in the southern province of Sierra Leone. The population of public senior secondary schools in this city could be a very good proxy for the population of public senior secondary schools in the southern province of Sierra Leone.

Research Methodology

Research Design

Quantitative and qualitative data collection methods were employed. The variables included the areas of all teaching spaces and students enrollment.

Population and Sample

The population for this research comprised all the teaching classrooms and all senior secondary school students in all the public senior secondary schools in Bo city. The floor dimensions of one hundred and forty three (143) teaching classrooms and heights of their ceilings were measured and the student roll for the 2015/2016 academic year in each of the five sampled public senior secondary schools in Bo city were considered.

Instrumentation

Measuring tape (metric) was used to measure the dimensions of the teaching classroom floors of the selected public senior secondary schools in Bo city.

Sampling Techniques

Purposive sampling was used to select the six senior secondary schools as they are the senior secondary schools with high demand in Bo city.

Data Collection Procedure

Two data collectors were recruited and trained on how to measure lengths correctly using the tape measure. The data collectors collected student's enrollment data for SSSI, SSSII and SSSIII (Arts, Commercial, and Science) for each sampled public senior secondary school in Bo city. The teaching classroom floor dimensions were measured including the ceiling height during lunch periods and weekends in order not to disrupt the normal teaching periods.

Method of Data Analysis

The following formula was used to calculate the number of students each teaching classroom in the selected senior secondary schools should ideally accommodate.

$$N = \frac{A}{1.86}$$

Where,

N is the number of students an ideal teaching classroom should accommodate,

A is the area of teaching classroom floor or area of assembly floor of selected public senior secondary schools.

$1.86m^2$ is the standard classroom floor space allowance per secondary school student in an ideal classroom as reported in the Welsh Government Circular, (number 021/2011 in October 2011) [8].

Results and Discussion

Results

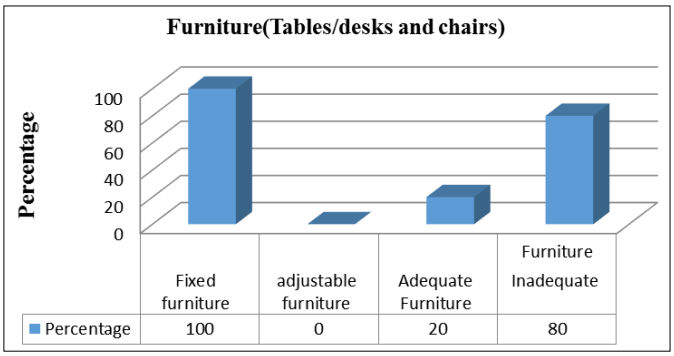

Fig 1: Type and Level of adequacy of Furniture in Sampled Senior Secondary Schools

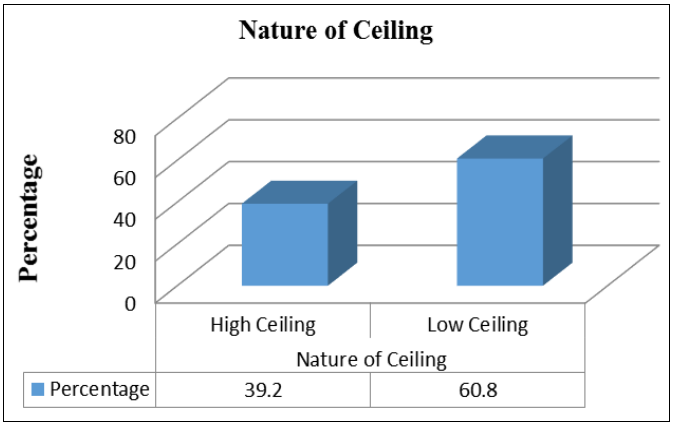

Fig 2: Nature of Ceilings in the Sampled Senior Secondary Schools

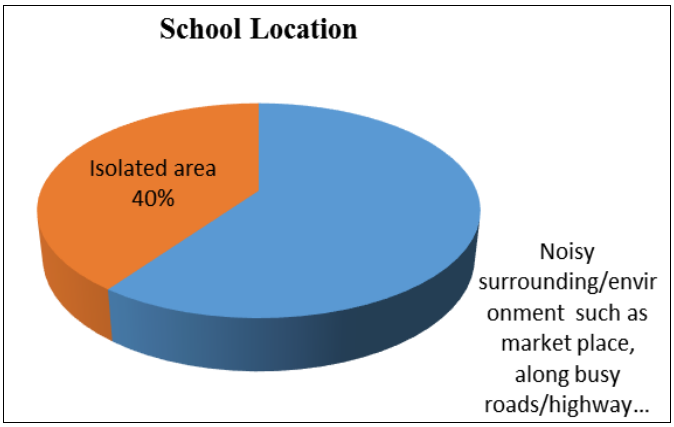

Fig 3: Sampled Senior Secondary School Location

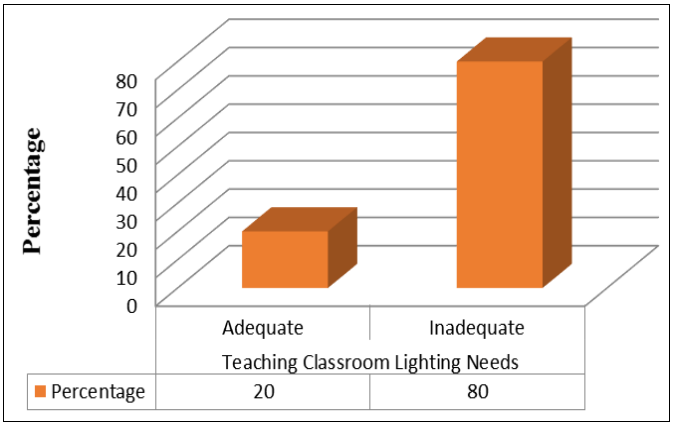

Fig 4: Teaching Classroom Lighting Needs

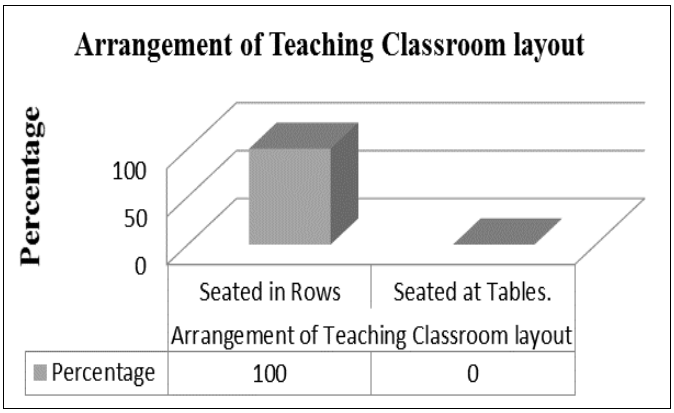

Fig 5: Arrangement of Teaching Classroom layout

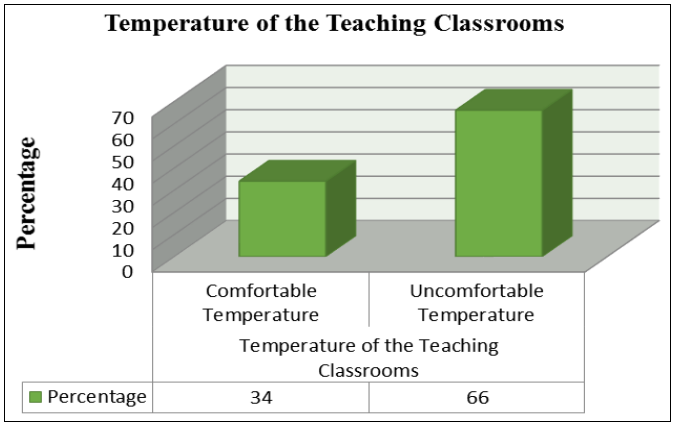

Fig 6: Temperature of the Teaching Classrooms

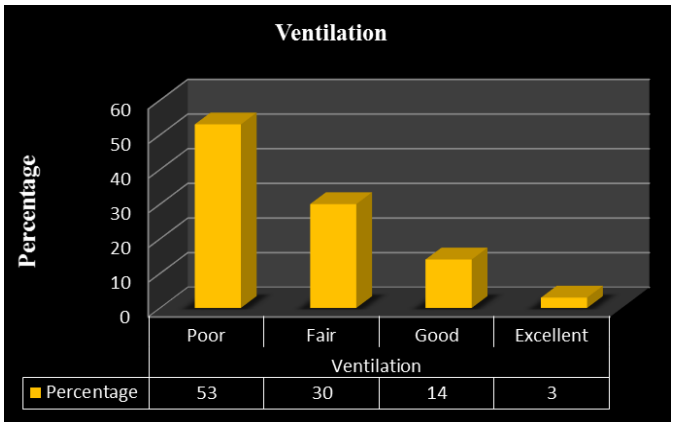

Fig 7: Ventilation

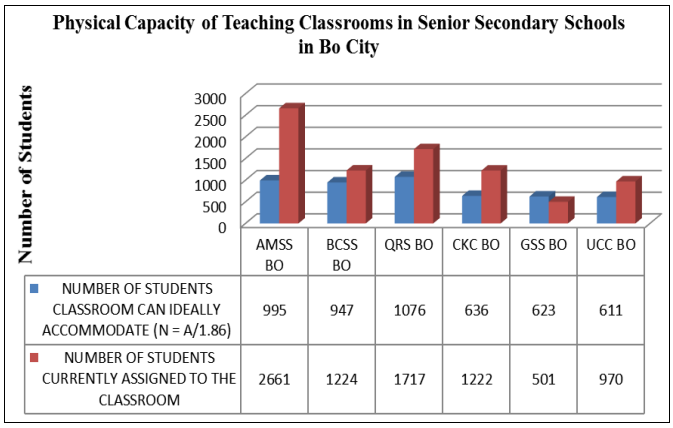

Fig 8: Physical Capacity of Teaching Classrooms in Senior Secondary schools in Bo City

Discussion

Physical Capacity of Teaching Classrooms

The findings show that with the exception of Government Senior secondary school, Bo, all other sampled senior secondary schools [Ahmadiyya Muslim Senior Secondary School (AMSS), Bo Commercial Senior Secondary School, Bo (BCSS); Queen of the Rosary Senior Secondary School, Bo (QRS); Christ the King college Senior Secondary School, Bo (CKC); and St. Andrews Senior Secondary School, Bo (UCC)] admitted more students than the teaching classrooms can ideally accommodate. Space affects teacher and learner feelings. This is specifically related to density, flow and furniture. Increased density leads to increased aggression that

can be counteracted by pedagogy, layout and programs. Students need a degree of privacy and ownership to feel a sense of belonging.

Type and Level of adequacy of Furniture in Sampled Senior Secondary Schools

Much of what is known about student comfort, particularly in terms of furniture, has yet to be translated into actual school environments in the sampled senior secondary schools. All students and teachers seat on fixed furniture instead of adjustable ones and majority of the respondents reported furniture inadequacy. Zandvliet & Straker (2001) as cited by Woolner (2010) [9] suggested that because school children are different in size, adjustable furniture might seem sensible. Molenbroek *et al*., (2003) [10] argued that the design of classroom furniture should be based on the student's popliteal height rather than body height. A study which used this idea and took anthropometric measurements of students' body dimensions (Parcells *et al*., 1999) as cited by Samia A. and Abdel Rahman Mohamed (2013) [11] concluded that there was a significant degree of mismatch between student's body dimensions and furniture that they use. Panagiotopoulou *et al.* (2004) cited by Steve Higgins *et al.* (2005) [12] also reported mismatch between the students' body dimensions and the classroom chair they use.

Type of Ceiling

Majority of the sampled senior secondary schools have low ceilings. Ahrentzen & Evans (1984) [12] found that higher ceilings in classrooms produce decreased perceptions by both teachers and children of crowding, with the height of the classroom ceiling correlating significantly with teacher satisfaction with the room. However, higher ceilings may cause other problems. Read *et al.* (1999) as cited by Higgins *et al.* (2005) [12] found that ceiling height affected co-operative behaviour among pre-school children, with the children displaying higher levels of cooperative behaviour in classrooms with lower ceilings. Earthman (2004, p.20) as cited by Higgins *et al.* (2005) [12] argues that a particular problem with older schools is that their high ceilings may negate the benefit of better lighting', while higher ceilings can also increase acoustic problems due to reverberation.

Senior Secondary School Location

Most senior secondary schools sampled are located near Noise surroundings/environment such as near a market place, hospital, or along busy roads / highways. The research into the effect of living or learning in noisy surroundings was initially driven by concerns about exposure to chronic external noise, such as that due to aircraft or road traffic. In a review of the area, Stansfeld and Matheson (2003) [12] discuss the possibility of health and psychological problems and conclude that: 'The evidence for effects of environmental noise on health is strongest for annoyance, sleep and cognitive performance in adults and children.' Cohen *et al.* (1980) [12] found evidence of raised blood pressure and signs of learned helplessness due to noise, although these problems have not been found by other studies (such as Haines *et al.*, 2001a) [12]. A more reliable finding is that chronic noise exposure impairs cognitive functioning and a number of studies have discovered noise-related reading problems (Haines *et al.*, 2001b; Evans & Maxwell, 1997) [12], deficiencies in pre-reading skills (Maxwell & Evans,2000) [12] and more general cognitive deficits (Lercher *et al.*, 2003) [12]. As a result, reviews of the consequences of aspects of the physical environment tend to conclude that acoustics and noise are important factors in a school environment (Fisher, 2001; Schneider, 2002; Earthman, 2004).Schneider (2002, p.6) [12] comments that in general the research is 'consistent and convincing: good acoustics are fundamental to good academic performance'.

Seating Arrangement in Teaching Classrooms

In all the teaching classrooms of the sampled schools, students seat in rows and not at tables. One of the more basic variables that can be altered in the classroom is the arrangement of the students' desks and chairs, and this issue has been quite well researched and debated by educationalists. Rows of desks are considered to be appropriate to individual work and increase time on-task (Galton *et al.*, 1999) [12]. The research which specifically compares rows and tables (Wheldall *et al.*, 1981; Wheldall & Lam, 1987; Hastings, 1995) [12] suggests that less attentive and less successful pupils are particularly affected by the desk arrangement, with their on-task behaviour increasing very significantly when seated in rows instead of at tables.

Teaching Classroom Lighting Needs

Majority of the sampled senior secondary schools are still running afternoon shift which ends at 6:00 pm. According to the research findings, majority of the sampled schools have inadequate lighting facilities especially in the evening hours. In relation to student achievement it is argued that day lighting offers the most positive effect (Earthman, 2004; Heschong Mahone Group, 2003) [12] as daylight produces biological effects on the human body (Wurtman, 1975) [12]. However, having solely a daylight source in the classroom is not practical or possible. Benya (2001, p.1) [12] suggested that for 'lighting to be effective, daylight must be supplemented by automatically controlled electric lighting that dims in response to daylight levels'. Barnitt (2003) [12] suggests that good lighting can only be achieved by a combination of direct and indirect lighting.

Temperature of the Teaching Classrooms

Majority of the teachers reported experiencing uncomfortable temperature in the afternoon hours as this is the time that most of the sampled senior secondary schools in the afternoon shift commence their lessons. Even those who do not run shift do experience uncomfortable temperature during the afternoon sessions. Earthman (2004) [12] rates temperature as one of the three most important individual elements for student achievement.

Ventilation in the classrooms

Slightly above half of the respondents reported experiencing poor air quality in their teaching classrooms during the afternoon shift. Kimmel *et al.*, (2000) and Khattar *et al.*, (2003) emphasized the importance of ventilation in educational institutions while Lee & Chang, (2000); Kimmel *et al.*, (2000) and Khattar *et al.*, (2003) reported the inadequacies of indoor air in schools and Ahman *et al.*, (2000) linked it to ill-health all cited by Higgins *et al.* (2005) [12].

Conclusion

The teaching classroom is expected to be attractive,

comfortable, and functional, where each student in a classroom should have adequate space to work and be able to easily get to and from his or her seat. Also, it should be a "home away from home" for both teachers and the students. However, the research reveals that the teaching classrooms in the sampled public senior secondary schools in Bo city, southern Sierra Leone are overcrowded, majority have low ceiling, poor ventilation, uncomfortable temperature, noisy locations, and all have row layout.

Recommendation

- Administrators and Ministry of Education Science and Technology should now use the idea of net capacity to determine the number of students each senior secondary school should admit instead of the long made use of teacher/pupil ratio.
- Every senior secondary school administration in collaboration with the Ministry of Education Science and Technology and the parents should work together in order to provide more classroom structures in all senior secondary schools.
- Administrators should design larger teaching spaces with moveable and demountable partitions in order to ease remodeling than smaller spaces.
- Provide ramps and wider doors to allow students with disabilities to easily access the teaching classrooms and other facilities.

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