The Availability of Qualified Teachers and Computer Laboratories for Teaching Computer Studies in Public Secondary Schools in Zambia: A Case Study of Lusaka City

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ABSTRACT

For schools to successfully deliver the computer studies curriculum, they should have, among other things, qualified teachers and computer laboratories. This study investigated the availability of qualified computer studies teachers and computer laboratories in public secondary schools in Lusaka City, Zambia. A mixed-methods approach was employed in which 61 schools out of 72 were randomly selected to take part in a survey, and this was followed by interviews, observations, interviews and documentary analysis. Among those surveyed, 50 schools completed the questionnaire, and the results show that 76% of computer studies teachers have qualifications in computer studies or information and communication technologies (ICTs) and the majority (55%) hold a diploma. However, there is a higher teacher-pupil ratio of as high as 1:276. The findings further show that 98% of the schools have computer laboratories and the majority have a lower computer-pupil ratio of 1:2 and 1:3. The results also show that data projectors and air conditioning units are available in many computer laboratories. However, many computer laboratories do not have servers and Internet connectivity. Given the above findings, it has been recommended that the Government of Zambia recruit more computer studies teachers and that school managers ensure the availability of facilities such as Internet connectivity in the computer laboratories.

Keywords: *Computer studies teachers; Computer laboratories; Educational resources; Lusaka; Zambia*

INTRODUCTION

The demands of the 21st century dictate that learners be equipped with the requisite skills to competently engage and perform in the new information age *(*Mulauzi, *et al.,* 2020). In this regard, graduates of an education system need to possess digital skills. According to the Zambian government, teaching Computer Studies in schools will not only produce graduates with digital skills but also spur innovation, thus, helping the country achieve its 2030 vision (Shafika, 2007). To achieve this, the Zambian Government has reformed the school curriculum to include subjects such as Computer Studies. In 2013, Computer Studies was introduced in secondary schools in Zambia as a subject. The introduction of Computer Studies in Schools has come with many challenges. Many critical educational inputs such as qualified teachers to teach Computer Studies and computer laboratories have been observed not to be available in some schools in Zambia, and where these inputs are available, they are said to be inadequate (Policy Monitoring and Research Centre, 2020). Mulauzi *et al.,* (2020) point out that lack of and/or inadequate ICT infrastructure is a serious obstacle to teaching and learning computer studies in schools, especially in developing countries such as Zambia. There is consensus on the fact that without adequate provision of trained teachers and computer laboratories, schools cannot satisfactorily teach Computer Studies. Therefore, ICT infrastructure investments and recruitment of Computer Studies teachers are critical to the successful delivery of the computer studies curriculum. This study, therefore, sought to analyse the availability of the two critical educational inputs (qualified teachers and computer laboratories) in Zambian's public secondary schools with a focus on Lusaka City.

Problem Statement

Delivering any curriculum requires the availability of educational inputs which include trained teachers and teaching aids in the correct proportions. Since the introduction of Computer Studies as a subject in secondary schools in 2013, teaching this subject has been marred with challenges relating to the provision of the necessary educational inputs. The Zambian Parliamentary Committee on Education, Science and Technology has observed that the majority of the schools are not equipped with the basic ICT infrastructure necessary for teaching and learning Computer Studies (National Assembly of Zambia, 2019). Further, Mulauzi *et al.,* (2020) observed that the condition of some computer laboratories in schools is not suitable to support the teaching and learning of computer studies. It has also been observed that the implementation of the Computer Studies curriculum in schools faces the problem of a lack of qualified teachers (Mambwe, 2016). Studies by Mambwe (2016); Policy Monitoring and Research Centre (2020); Mulauzi *et al.,* (2020) have failed to qualify the shortage of the two educational materials in terms of teacher-pupil and pupil-computer ratios. Further, many of the studies on the challenges of teaching computer studies focus on rural areas, neglecting urban towns such as Lusaka City. It was therefore imperative that a study was conducted in Lusaka City to critically analyse the availability of these two educational inputs, and their propositions as regards pupil-teacher and pupil-computer ratios.

Objectives of the Study

The main objective of the study was to analyse the availability of qualified teachers and computer laboratories needed for the teaching of computer studies in public secondary schools in Lusaka. The study specifically sought to:
    (i)   establish the available number of qualified computer studies teachers in schools
    (ii) determine the prevailing teacher-pupil ratios in the computer studies subject,
    (iii) establish the availability of computer laboratories in schools,
    (iv) establish the prevailing pupil-computer ratio,
    (v)   assess the ICT facilities available in computer laboratories.

LITERATURE REVIEW

In March 2007, the Zambian government launched its national Information Communication and Technology (ICT) policy. During the launch, the government emphasised the creation of an innovative, market-responsive, highly competitive, coordinated, and well-regulated ICT industry. To achieve this, the government thought of introducing Computer Studies as a subject to be taught in schools. In 2013, the educational curriculum was reviewed and Computer Studies as a teaching subject was introduced (Mumba, 2016). The introduction of Computer Studies in Zambia was viewed as a major milestone toward creating a digital society in which the use of ICT will permeate all sectors of the economy (Chikumba, 2010). ICT has been viewed as a major tool that spurs national development. Further, ICT is a tool that could help entrench democratic values in society, as it facilitates access to information, hence, fostering participation in the governance of a country (Devia, *et al.,* 2021). Access to information fosters accountability and transparency in the management of public affairs, thus, curbing abuse of resources and corruption. ICT is also a vital tool in fostering the teaching and learning of other subjects in schools. A wide range of educational resources can be accessed through ICT facilities such as the Internet, hence, providing the means to bypass the bottlenecks of access to educational materials (Fu, 2013). In addition, the teaching of Computer Studies can advance higher order thinking skills such as comprehension, reasoning, problem-solving and creative thinking and enhance employability (Olan'g, 2015). As a result of these and many other benefits of using ICTs, it was salient for the Government of Zambia to begin teaching computer studies as a subject in schools to equip Zambians with ICT skills at an early age in their lives.

Educational Inputs for Teaching Computer Studies in Schools

Like any other subject, teaching computer studies in school needs various educational inputs. Among the principal inputs are qualified teachers and computer laboratories. According to Olan'g (2015), for successful teaching of computer studies, schools need to mobilise inputs such as qualified teachers, computer laboratories, and textbooks. These educational inputs could be referred to as endogenous inputs because they are school-related inputs that the school has control over. Endogenous inputs include teacher characteristics, student-teacher ratio, student-classroom ratio, student-textbook ratio, physical facilities, instructional materials, and school leadership (Ntawiha, 2011). It is important to mention that other educational inputs such as exogenous (which include the pupil's background) and financial, are cardinal for the teaching of any given subject. These inputs must be mixed in correct quantities if the intended learning outcomes are to be achieved.

Qualified Staff in the Delivery of the Curriculum

No matter how good the curriculum could be, the failure of the educational system to recruit qualified teachers to deliver the subject content to the learners will result in poor educational outputs. A growing number of studies provide conclusive evidence that teacher quality is the primary school-related factor affecting student achievement. Students who are taught by effective and competent teachers excel quickly, while those who are assigned to the least effective teachers lag behind and often never catch up (Congress of The United States of America, 2004). Further, it has been observed that teacher subject knowledge is greatly associated with student learning (ORCHIDS - The International School, 2021). Well-qualified teachers are an important educational input as they possess both theoretical and practical skills in their subject area. Further, qualified teachers know how and when to use various teaching methods and technologies at their disposal. According to ORCHIDS - The International School (2021), a qualified teacher can provide various educational resources and connect with the learners easily.

The introduction of computer studies in schools in many countries in sub-Saharan Africa is punctuated by a shortage of qualified teachers. This important educational input (trained teachers) in many countries in the region is in short supply, hence, affecting the effective teaching of computer studies in schools. In Malawi, a study conducted by Chikumba (2010) cited the need for the Government of Malawi to invest in staff to improve the performance of public schools in a computer science subject. He observed that among other things, private schools had more qualified computer studies teachers, hence they performed better in this subject compared to the public schools. In Tanzania, Olan'g (2015) observed that most schools do not effectively implement computer studies subjects. This is because of a lack of competent qualified teachers. In Zambia, many studies on the implementation of the computer studies curriculum have highlighted the lack of or the inadequacy of the number of qualified computer studies teachers as one of the major challenges schools are facing in teaching computer studies. Studies by Mambwe (2016); Mulauzi *et al.,* (2020); Policy Monitoring and Research Centre, 2020); Masumba & Mulenga (2019) have established that the shortage of qualified computer studies teachers is one of the major challenges in teaching computer studies in schools in Zambia. This problem is said to be acute in rural areas of Zambia. For example, a study conducted by Masumba & Mulenga (2019) in the North-Western province of Zambia among 12 computer studies teachers revealed that only one (1) teacher was qualified in computer science. Further, research has shown that in schools where computer science teachers are available, they are over-stretched as they are required to teach many classes. The teacher-pupil ratio in computer science subject classes indicate that, as of 2015, there were 482 computer studies teachers against 96,228 learners, resulting in a pupil-teacher ratio of 199:1 (Policy Monitoring and Research Centre, 2020). This pupil-teacher ratio is too high for successful quality education delivery.

Computer Laboratories in Schools

In teaching computer studies, a computer laboratory is so critical that its absence can result in producing graduates with only theoretical knowledge. A computer laboratory is a room or space equipped with computers (networked or not) devoted to pedagogical use in a school. A computer laboratory must be safe from any disruptive, non-pedagogical content; and pupils and teachers may need authorised access credentials (UNESCO, 2022). It is the nerve centre for computer studies in schools. A computer laboratory is a special place in a school where computers and all other devices are found. It is also a place where practical application of the knowledge of computers can be utilised. Therefore, in a computer laboratory, students are exposed to real knowledge of computer applications using both computer hardware and software (Olan'g, 2015). A computer laboratory is also needed for students to practice how to use various computer packages which include Word Processing and Excel (Sharma, 2019). There are three common types of computer laboratories, namely the classical laboratory (with desktop computers), the mobile laptop laboratory (that moves from classroom to classroom), and the mini-laboratory which is located in an individual classroom for a teacher to use in their daily work without having to leave the classroom (Demand Media, Inc, 2011).

In Zambian schools, the practice is to have a fixed computer laboratory structure with desktop computers and other equipment permanently placed in the laboratory. However, some schools have temporal computer laboratories. As of 2018, the country had a total of 2,811 computer laboratories in schools of which, 2,584 were permanent, 113 were temporal (mobile) and 114 were incomplete laboratories (Policy Monitoring and Research Centre, 2020). Studies have revealed that the Zambian educational system has an insufficient number of computer laboratories to support the teaching of computer studies. A study by Mambwe (2016) in Luapula province of Zambia revealed that 17.6% of the surveyed schools had a computer laboratory while 82.4% did not. Further, a study conducted by Nkhoma (2019) in 4 districts of Zambia among 134 teachers and senior educational officers revealed that many schools lacked ICT facilities which included computer laboratories (Nkhoma, 2019).

In schools with computer laboratories, computers are not enough. Pupils are reported to be sharing one computer and there is a high pupil-to-computer ratio of 10:1 in some parts of the country such as Luapula province. (Mambwe, 2016). In some schools, one computer is shared by more than 10 pupils. This is against the widely accepted pupil computer ratio in schools in the United States of 6:1 (National Centre for Educational Statistics, 1999). Furthermore, many schools in Zambia lack other information and communication technology tools such as the Internet. A study by Nsama, *et al.,* (2021) among 324 teachers in Lusaka, Copperbelt, and Eastern and Luapula provinces of Zambia revealed that 98.6% of respondents indicated that they had poor Internet and other multimedia platforms in their schools.

Apart from having computers, a computer laboratory should have other basic equipment and facilities including Internet connectivity, server hardware, projector/s, and an air conditioning unit/s. All devices in a computer laboratory should have access to the Internet (The University of Chicago, 2022). This is to ensure that learners and teachers have access to learning resources available via the Internet. To facilitate the sharing of files, equipment, and software and provide hosting services, a computer laboratory needs to have a server. The server can also be used to filter the external information the clients can access, for example, by blocking Facebook and other sites that may be a distraction to the learners (Classroom, 2018). Air conditioning units are needed to protect the equipment by controlling the temperature in the laboratory. Computer systems that retain optimal cool temperature ranges work faster and more efficiently, and this drastically reduces general wear and tear (General Machenical, 2017). Projectors, whether interactive or data projectors, are essential to teaching technical subjects such as computer studies. They enable teachers to make

PowerPoint presentations thereby allowing learners to take better notes and discern what the teacher is explaining. Projectors enable teaching to be more visually engaging which, in turn, can help to increase attention (Diggins, 2018).

The review of the above studies indicates attempts to address the problem under investigation. However, some of the studies have been generally highlighting the challenges of implementing the teaching of computer studies in school without analysing the severity of the challenges in urban and rural areas. For example, the studies by Nkhoma (2019); Policy Monitoring and Research Centre (2020); Mulauzi *et al.,* (2020), and Nsama, *et al.,* (2021) have revealed the general lack of qualified computer studies teachers and a lack of computer laboratories at the national level. They have neglected to show how acute the shortage of qualified computer science teachers is and the lack of computer laboratories in schools in Zambia among urban and rural schools. Further, studies by Mambwe (2016); and Masumba & Mulenga (2019) highlighted the shortage of qualified teachers to teach computer studies and computer laboratories only in rural areas. They have not addressed the shortage of these two educational resources in urban schools. Further, the above-mentioned studies have not endeavored to survey the availability of equipment and other facilities in computer laboratories that are key to the successful delivery of the computer studies curriculum. Due to the gaps in the reviewed studies, this study was conducted to establish if Lusaka City like other areas in Zambia lack computer studies teachers and computer laboratories. Furthermore, this study was conducted to establish the extent to which equipment and facilities such as the Internet, servers, air conditioning units, and projectors are available in public schools in Lusaka City.

Conceptualizing the Computer-Pupil Ratio

There are international and national standards as regards the recommended teacher-pupil ratio in a classroom. The Organization for Economic Co-operation and Development (OECD) puts the global average teacher-pupil ratio at 1:23 in a secondary school (OECD, 2019). In Norway, the national standard teacher-pupil ratio is 1:10. In Zambia, the recommended teacher-pupil ratio is 1:40 in primary and 1:35 in secondary (Southern and Eastern Africa Consortium for Monitoring Educational Quality, 2011). In this study, any teacher-pupil ratio observation that is above the national set standard of 1:35 has been deemed to be high and not suited for teaching computer studies in schools. In terms of the recommended computer-pupils ratio, the President's Committee of Advisors on Science and Technology in the USA recommended a 1:5 ratio (National Centre for Educational Statistics, 1999). This has been revised to 1:2 in countries which include the USA and Great Britain. In Zambia, there is no national standard on the computer-pupil ratio. Therefore, the 1:5 computer-pupil ratio has been adopted for this study. Any ratios observed to be above 1:5 have been considered to be high and hinder the acquisition of practical computer skills.

RESEARCH METHODOLOGY

The study was both qualitative and qualitative in design. A survey approach was employed in which data were collected from a sample of public secondary schools in Lusaka. A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population (Borg & Gall, 1989). The population of the study comprised 72 public secondary schools and a sample of 61 public schools was selected using a simple random sampling method. The sample size was drawn based on Slovin's formula [n =N/ (1+Ne2)], with a margin of error of 5% (0.05), giving a confidence level of 95%. The sample was large to ensure the validity of the research findings. Quantitative data were collected using a questionnaire which was answered by a computer studies teacher or a person in charge of the computer studies section in a school. Qualitative data were collected through interviews and observations to validate quantitative data. Further, qualitative data were collected through content analysis in which relevant documents from the Ministry of Education in Zambia were analysed. Quantitative data were

analysed using the Statistical Package for Social Sciences (SPSS) software and descriptive statistics were generated.

RESEARCH FINDINGS

While 61 schools were selected for the study, only 50 schools completed the questionnaire for a response rate of 83%. Table 1 below presents the characteristics of respondents. In terms of gender, the majority (60%) of the computer studies teachers were males while 40% were females. Further, 50% of the computer studies teachers were between 31-40 years.

Table 1: Characteristics of Respondents

| Variable	Value	Frequency	Percent (%)
Gender	Male	30	60
	Female	20	40
Age (years)	< 30	12	24
	31 – 40	25	50
	41 – 50	12	24
	51>	1	2

Many schools in Lusaka city are mixed (combined) schools offering both primary and secondary levels of education, and the majority (90%) of the teachers were drawn from combined schools as shown in Table 2 below.

Table 2: Profile of Schools for Respondents

School	Frequency	Percent (%)
Girls Boarding School	1	2
Boys Boarding School	1	2
Combined Day and Boarding	3	6
Combined Day School	45	90
Total	**50**	**100**

Training in Computer Studies

Figure 1 below shows that most of the teachers (38 or 76%) of computer studies in Lusaka City have received training in Computer Studies or Information and Communication Technologies (ICTs) while 12 (24%) indicated not having been trained to teach computer studies or ICTs.
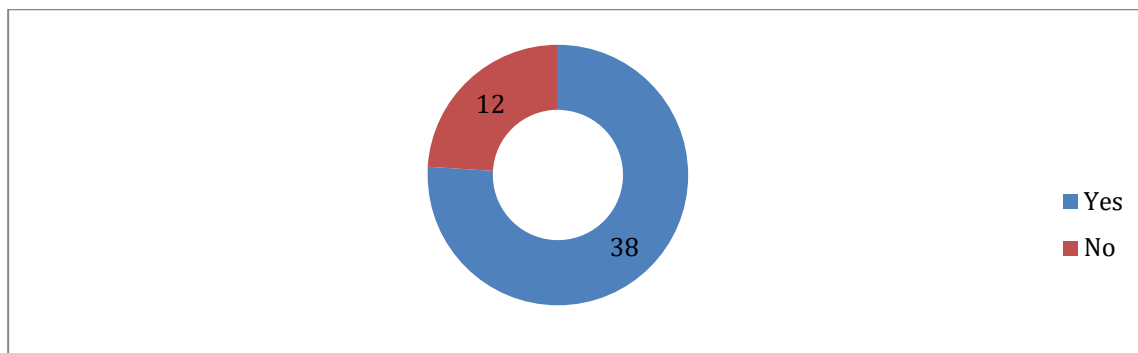
Figure 1: Trained in Computer Studies or ICTs

The study findings in Table 3 reveal that most of the teachers of computer studies without specialised training in Computer Studies or ICTs are found in combined schools. The combined schools in Zambia were initial primary or basic schools which have been updated into day secondary schools. They cover both primary and secondary levels of education.

Table 3: Computer Teacher by Training and School Status

		School Status				Total
		Girls Boarding School	*Boys Boarding School*	*Combined Day and Boarding School*	*Combine d Day School*	
Computer Teacher by Training	*Yes*	0	1	3	34	**38**
	No	1	0	0	11	**12**
Total		1	1	3	45	**50**

Further, as shown in Table 4 below 55.2% of teachers of computer studies possess a diploma qualification in computer studies or ICTs. There is a considerably high percentage (42.1%) of teachers with a first degree in computer studies/ICTs who are teaching computer studies in public schools in Lusaka City.

Table 4: Level of Training in Computer Studies

		Level of Training		
		Diploma	*Bachelor's Degree*	*Master's Degree*
Trained in Computer Studies	Yes	21(55.2%)	16 (42.1 %)	1 (2.6%)
	No	7 (58.33%)	4 (33.3%)	1 (8.3%)
Total		**28 (56%)**	**20 (40%)**	**2 (4%)**

Teacher-Pupil Ratio in Computer Studies

The teacher-pupil ratio is very high - in almost all the schools in Lusaka, one teacher teaches more than 146 pupils. In some schools, the teacher-pupil ratio is as high as 1 teacher to 276 pupils (1:276). Teacher **A** from a high-ranked Day Secondary School (a grade 1 school) in Lusaka explained that she teaches five classes of junior secondary level with an average of 55 pupils in each class.

> "*I teach three grade 8 classes with 55 pupils in each class. I also teach two grade 9 classes, one with 56 pupils and the other class with 55 pupils*" **Teacher A**.

Another teacher from a Day Secondary School explained that she teaches two classes for G 8 and G9 with 60 and 70 students respectively.

> "*I handle two classes of computer studies. A grade 8 class with 65 pupils and a grade 9 class with 70 pupils*" **Teacher B**.

Another teacher (Teacher **C**) from a Technical Boarding School indicated that the school has eight classes for Junior secondary: 4 grade 8 classes and 4-grade classes with 40 pupils in each class. The teacher further explained that at the senior secondary level (G10, G11, and G12); there is one class of computer studies with 40 pupils in each class. The school only has three computer studies teachers to teach these eleven (11) classes.

Availability of Computer Laboratories in Schools

The study findings show that almost all the schools surveyed have a computer laboratory. As shown in Figure 2, 49 (98%) of the schools indicated having computer laboratories while one (2%) had no computer laboratory.
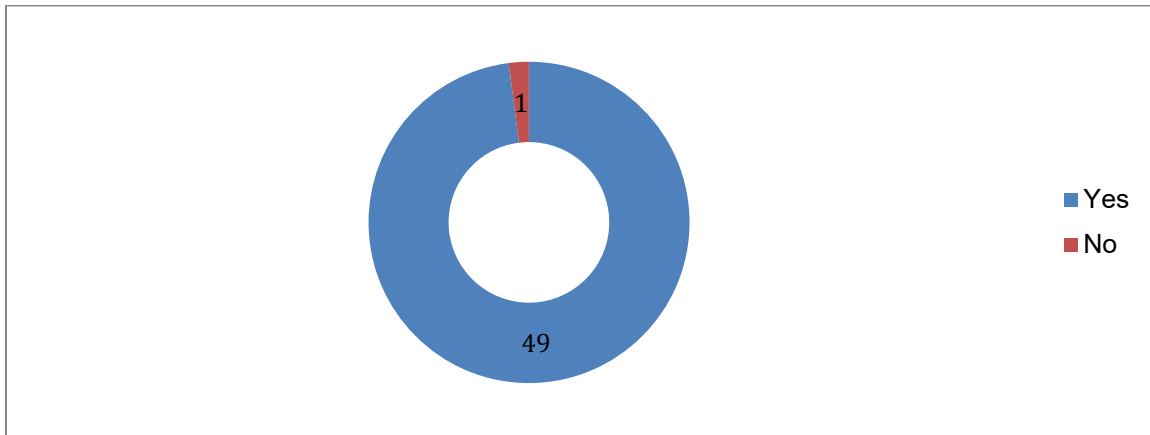
Figure 2: Availability of Computer Labs in Schools

As can be seen in Table 5 below, 34% of the schools indicated having a computer laboratory with computers in a range of 11-20 while 32% of the schools had computers in the range of 21-30. Very few schools (4%) reported having computers in the range of 1-10.

Table 5: Number of Computers Available in a Computer Laboratory

Range	Frequency	Percent (%)
1 – 10	2	4
11 – 20	17	34
21 – 30	16	32
31 – 40	7	14
41 – 50	5	10.
51 +	2	4
N/A	1	2
Total	**50**	**100**

Computer-Pupil Ratio in Schools

In terms of the pupil-computer ratio, the data in Table 6 shows that in many schools, the computer-pupil ratio is good. Many schools are having a situation where one computer is shared by 2 or 3 pupils. However, as shown in Table 6, there is also a high proportion of schools (24%) where more than 7 students are sharing one computer.

Table 6: Computer-Pupil Ratio

Computer-Pupil Ratio	Frequency	Percent (%)
1 to1	2	4
1 to 2	16	32
1 to 3	12	24
1 to 4	3	6
1 to 5	2	4
1 to 6	2	4
1to 7 +	12	24
N/A	1	2
Total	**50**	**100**

The results have further shown that the computer-pupil ratio is higher in combined-day secondary schools. As indicated earlier, combined schools were initially constructed to be primary schools but were upgraded to allow the enrolment of secondary school pupils.

Further, the study has revealed that many schools do not have information and communication facilities such as Internet connectivity. As shown in Table 7, 64% of the schools reported not having Internet connectivity in their computer laboratories. Further, 76% of schools reported not having computer servers. However, 50% of the schools reported having air conditioning units, while 76% indicated having data projectors in the computer laboratories.

Table 7: Availability of Information Communication Technology Facilities in Computer Laboratories

ICT Facility	Available	Not Available	N/A
Internet Connectivity	17 (34%)	32 (64%)	1 (2%)
Computer Servers	11(22%)	38 (76%)	1 (2%)
Air Conditioning Units	25 (50%)	24 (48%)	1 (2%)
Projectors	38 (76%)	11(22%)	1 (2%)

DISCUSSION OF THE FINDINGS

The findings of the study show that most of the computer studies teachers (76%) in Lusaka are trained in Computer Studies or ICTs. Many possess a diploma qualification in computer studies/ICT. This is contrary to studies by Masumba & Mulenga (2019); Mambwe (2016); Mulauzi *et al.,* (2020) at the national level which found that many teachers that teach computer studies in schools are not qualified. This finding that many teachers who teach computer studies in Lusaka have the requisite qualifications to teach the subject is important for understanding the differences at the local level. However, the study has revealed that the number of qualified computer studies teachers are not enough to teach the many computer studies classes required in Lusaka City public schools. This teacher-pupil ratio is higher than the set national and international standards. In Zambia, the nationally accepted teacher-pupil ratio is 1:35, and internationally, the ratio is set at 1:23 (Southern and Eastern Africa Consortium for Monitoring Educational Quality, 2011; OECD, 2019). In some schools, one teacher teaches over 276 pupils. The over-stretching of this educational resource leads to staff burnout which indirectly affects the quality of education being provided.

It has also been established that a few of the schools that did not have qualified computer studies teachers were in the combined schools category. These schools were previously basic and were recently upgraded to the status of day secondary schools. In these combined schools, Mathematics or Commerce teachers are assigned to teach Computer Studies. Follow-up interviews with some teachers revealed that the lack of computer studies teachers in some public secondary schools is partly due to administrative inefficiency in the allocation of qualified teachers. In this regard, some teachers who obtained a qualification in computer studies or ICTs are still teaching in primary schools instead of being assigned to secondary schools.

The findings of this study have revealed that almost all (98%) of the public secondary schools in Lusaka have computer laboratories and the majority (67%) of the schools have computers in the range of 11-30. These findings are significant as they update those by Mambwe (2016) who established that more than 82.4% of schools in the Luapula province of Zambia had no computer laboratories. We found that almost all public secondary schools in Lusaka City have computer laboratories to facilitate the teaching of computer studies. However, it has been established that some computers in the laboratories are not functional, thereby reducing the number of computers available for pupils to use during practical lessons. The computer-pupil ratio appears to be good in many of the schools surveyed with 56% of schools having 1:2 and 1:3 ratios. This is better than the internationally recommended ratio of 1:5 and differs from the findings of Mambwe (2016) who found a computer-pupil ratio of 1:10 in public schools in the Luapula province of Zambia. It is also important to mention that some public secondary schools in Lusaka City (24%) still have a computer–pupil ratio of as high as 1:7. This implies that in some public schools in Lusaka City, many pupils use one computer during practical lessons. The high computer-pupil ratio hurts the ability of the schools to emphasise practical computer /ICT skills. The result is that the schools are producing graduates without the practical skills needed in the 21st century.

In terms of the availability of ICT facilities and equipment in computer laboratories in public schools in Lusaka City, many of the computer laboratories (64%) are not connected to the Internet. In 2020, the Policy Monitoring and Research Centre observed that many public schools in Zambia had no Internet connectivity. This situation seems not to have improved. This implies that pupils and teachers cannot use computer laboratories to access the Internet to do research, not only in computer studies subjects but also in other subjects. The findings of the study have also shown that very few schools (22%) have computer servers in their computer laboratories. In the absence of servers, schools are unable to, among other things, host web-based systems such as school management systems and school websites. Further, without servers, schools cannot share resources such as printers and are unable to control access to undesired websites on the Internet. It is however gratifying to observe that most of the schools (76%) have general data projectors in their computer laboratories. According to Davis (2022), data projectors are widely used in classrooms. Data projectors are an essential teaching tool for the successful delivery of practical subjects such as computer studies as they enable teachers to project lessons, thereby enabling the learners to see what the teacher is talking about. Further, 50 % of computer laboratories in Lusaka have air conditioning units to regulate the temperature in the laboratory. This implies that in half of the surveyed schools, computer equipment is not protected from excessive heat, which may cause malfunction of the equipment in the computer laboratory.

CONCLUSION AND RECOMMENDATIONS

In conclusion, it can be said that many of the public secondary schools surveyed in Lusaka City have qualified teachers to teach computer studies. This is contrary to what is happening in other parts of the country where teachers without prior training in computer studies or ICTs are teaching computer studies in schools. However, there is a high teacher-pupil ratio in schools in Lusaka as too few teachers are teaching many pupils. It has also been established that almost all public secondary schools in Lusaka City have a computer laboratory with the majority having a lower computer-pupil ratio of 1:2 and 1:3. The study has also established that half of the laboratories have air conditioning units to control the temperature and that 76% of the schools have data projectors for teaching computer studies. However, many laboratories do not have Internet connectivity and servers for their computers. Arising from the above findings, the following recommendations are made:

(i)   The Government of Zambia should ensure that more qualified computer studies teachers are deployed in schools to reduce the teacher-pupil ratio.
(ii) School managers should ensure that all schools have computer laboratories with Internet connectivity.
(iii) School authorities should ensure the availability of air conditioning units, servers, and projectors in the laboratories.

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