An Investigation of Academic Performance of Grade 9 Learners of Computer Studies: A Case of Chamunda Secondary School of Masaiti District, Zambia

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Abstract: - **Development and teaching of Computer Studies in African secondary schools is vital if the continent is to reduce the knowledge, technological and economic gaps between itself and the rest of the world. But there had been few or no studies conducted to establish the performance of learners in Computer Studies subject so as to determine the worthiness of integrating it in school curriculum. There is a significant gap within the current bodies of research, most research does not focus on performance of learners in Computer Studies. This research aimed to fill this gap by addressing the performance of learners in Computer Studies since it was introduced in Secondary Schools in Zambia. A mixed method was adopted, using a convergent concurrent parallel design. The qualitative methods used interviews, while the quantitative used a descriptive cross sectional study. A 100 Pupils were randomly selected to respond to the questionnaire and 13 staffs that included the Head teacher and teachers teaching computer studies were interviewed, making a total sample of 113. Fewer teachers were found teaching computer studies, while the Examination Council of Zambia archives of Grade 9 results for 2015, 2016 and 2017 showed a decreasing trend in performance. The pass rate in 2015 was 56%. In 2016 the pass rate was 38%. In 2017 the pass rate was 23%. Boys performed better than girls over the years. The study revealed a third of the learners had positive perception, with a dominance of males towards. Students challenges were computer accessibility and those that never had access were (65%). These results suggested that simply increasing the educational input on computers at school may not produce the desired effect; instead, the quality of teaching also matters. Integrating computer use into effective instructional activities plays a more important role in influencing student academic performance.**

Keywords: **Academic Performance, Information and Communication Technology, Grade 9 learners**

I. INTRODUCTION

The widespread use of Information and Communication Technologies (ICTs) has influenced all, among which lies education. All human life is affected by technology including the way we interact with each other. One cannot think of life without ICT, it is an indispensable tool. The use of technology and proliferation of computers and internet has brought about a lot of changes in the way organizations conduct their businesses. Not only in the business world but also in the education sector where the knowledge of ICTs has brought about improvements in the education processes such as administration, assessment and management of various stages in the education sector (Adewole, 2008). CT has become an important requirement for participation in society and the workplace. All learners need to become competent with ICT skills to fully engage in social activities. This is particularly important as public and other services are increasingly available online. Finally, ICT has the potential to transform pedagogical practices and increase the breadth and richness of teaching and learning (Adewole, 2010; Chuni et al., 2018).

Following this assertion, in March 2007, the Zambian government launched its National ICT policy with the main objective of integrating Computer Studies into the educational curriculum so as to provide equitable access for all students regardless of the academic level. The policy stated that Computer Studies was to be introduced as a subject in government schools as only Private schools were producing ICT literate students at the time (MoCT, 2006). It also highlighted challenges such as the financial and technological resource constraints, inadequate awareness on the benefits of integrating ICTs in the administration of the delivery chain of education sector, and the high opportunity costs and lack of coordination (Warschauer, 2010). It further, suggests for the scale up of the introduction of Computer Studies in schools. Though Computer Studies was integrated in the Revised Curriculum in 2013 as a single subject, it only became compulsory at Grade 9 levels in 2014 (Ministry of Education (MoE), 2013).

ICTs in Zambia are on the increase almost everywhere, including schools. ICTs have become part of survival skills in this era. The chances of one to be employed without the knowledge of ICT are becoming slim. So the Government of Zambia felt it critical that learners should be

taught effectively how to apply ICTs and this is the reason why the Ministry of General Education introduced Computer Studies as a compulsory subject at Grade 9. The Zambian curriculum was reviewed because of the growing need of including Computer Studies in the curriculum so that pupils are not left behind in the global world (Zambia Ministry of Education, 2006). But introduction of Computer Studies as a Subject in Secondary Schools had not come without challenges.

Habeenzu (2010) argued that while the Ministry of General Education's decision to introduce computer studies as a compulsory subject in secondary schools would be a step in the right direction, its implementation would have proved beyond the capabilities of those involved. This is because many schools including those in urban areas did not seem to have the required infrastructure such as computer laboratories, computers and trained computer studies teachers. In the 2015 Junior Secondary School Leaving Examinations, the performance of learners in Computer Studies was not impressive. According to the Examination Council of Zambia (ECZ) Report, Computer Studies recorded the second lowest mean score of 30.07%. Despite the Zambian government's effort to make computer studies compulsory, most schools offering Computer Studies at Junior Secondary in Masaiti seemed to have a number of challenges in meeting the requirements for successful teaching of computer studies such as enough computers and Computer Studies trained personnel. As such most teachers offering computer studies do not have necessary ICT skills to deliver lessons in this subject thoroughly.

However, while so much has been said about how ICTs could be used to improve teaching and learning experiences in science based subjects, very little, if any, is known about the performance of learners in Computer Studies since it was introduced in Zambian Schools (MoE, 2006). It was against this background that this study aimed to investigate the performance of learners in computer studies at Chamunda Secondary School in Masaiti District.

There was a significant gap within the current bodies of research, as much of the research focuses on best practice for teachers, rather than the performance of learners in Computer Studies. This research aimed to fill this gap by looking closely at the performance of learners in Computer Studies since it was introduced in Secondary Schools. Hence, a case study was conducted at Chamunda Secondary School in Masaiti District to determine the performance of Grade 9 learners in Computer Studies from 2015 to 2017.

II. METHODOLOGY

2.1 Study Design

A mixed method was adopted, making use of a convergent concurrent parallel design (triangulations). The qualitative methods used interviews, while the quantitative used a descriptive cross sectional study in strategically chosen secondary school of Masaiti District. In this study, mixed methods design was chosen because of the complexity of the research objectives; based on this premise it was vital. Mixing various methods allows the possibility of getting a more accurate picture of the phenomenon, while different methods help to answer slightly different questions (Chiluba, 2017); provided for a greater diversity of views and helped to understand complex phenomena.

The study was conducted at Chamunda Secondary School in Masaiti District. This school was chosen based on the premise that it is centrally located in Masaiti District and it has both boys and girls. At the same time, it is important to have a comparison of Computer Studies performance between boys and girl. This is because there is a suggestion in literature that boys tend to perform better than girls in Computer Studies. Chamunda Secondary is a school for both boys and girls that is committed to providing equitable learning environment that embraces intellectual, physical, social, moral and spiritual growth.

A sample size of 100 learners was determined and in addition, focus group discussions (FGDs) were used to collect additional data from learners from Chamunda Secondary. Each FGDs comprised of an initial sample size of 6 participants, which made a total of 12 participants from the school. Then one key informant from the school was considered. This sample size was based on the concept of theoretical saturation, meaning if the theory reached beyond the given numbers the sample size would increase respectively. Therefore, initially a total of 14 participants were considered for the qualitative part. A combined sample size was therefore 113

some socio-economic and demographic data were collected through desk review of previous performance of Grade 9 at Chamunda Secondary School. The review of secondary data provided predominant Computer Studies learning outcomes, education status, enrolment and exam attendance data and number of teachers at this school.

2.2 Data Analysis

Quantitatively data analysis was done using SPSS. For Univariate descriptive data, SPSS was used to generate frequency tables and measures of dispersion. Bivariate analysis was used to measure influence of specific variables on performance. Inferential statistics was used to assess the strength of relationships between specific categorical variables (Using Chi-square 2x 2 table at =<0.05 alpha. Presentation of results used different charts, graphs and frequency tables; excel generated and SPSS.

Qualitatively each data collector transcribed verbatim from audio to written language of analysis (English). The analysis was done manually using deductive coding to analyze qualitative data (also called: external codes or pre-set codes). These was determined prior to analysis generally to test and confirm selected variables. Coding themes were created as a

way to group together clusters of codes. Development of themes were based on the four principles; Firstly-Consistency: ideas that recur Second-Patterns: ideas that recur predictably Third-Contradictions: between ideas, patterns, respondents, between what you might expect to find and what you do find and Fourth- Salience: ideas that appear especially important to respondents, regardless of their frequency.

III. RESULTS

The main objective of the study was to investigate the academic performance of learners in Computer Studies at Chamunda Secondary School in Masaiti District of Zambia. The specific objectives of the study were to establish the types of ICT resources and infrastructure available for teaching and learning Computer Studies, to establish the availability of trained teachers to teach Computer Studies, to investigate the performance of Grade 9 learners in Computer Studies, to explore perception of Grade 9 learners towards Computer Studies and to identify challenges learners face as they learn Computer Studies.

3.1 Factors Associated with Computer Studies Performance

The Six Social Economic Status (SES) components were used to establish a relation to computer use. A one-way ANOVA was used to assess the differences among groups on computer study (see Table 3). Home computer exposure was the most commonly used SES component ($k= 30$), followed by school

computer use ($k= 15$), internet cafe ($k= 14$), The Q statistic of homogeneity indicated that the type of SES component significantly moderated the relation between SES and Computer Studies academic achievement, $Q_b(5, 79) = 587.14$, $p< .001$. A weighted ANOVA revealed that the average ES was .28 school computer use. SES measures based on "home resources" produced the highest mean ES (.51).25. The follow-up tests consisted of all pairwise comparisons among the six types of SES indicators. Pairwise comparisons were conducted using Bonferroni adjusted alpha levels of .003 per test (.05/15). Each of the pairwise comparisons between the three most commonly used indicators (Sex and age) were nonsignificant. Other pairwise comparisons, however, were all statistically significant at $p< .001$.

To estimate the effect of the pass rate of Computer Studies academic performance measure on the relation between SES and academic achievement, a separate database was constructed using studies that reported correlations on single or multiple academic achievement variables. In total, there were 167 independent correlations with a mean ES of .29. As presented in Table 3, there were four different measures used to assess academic achievement: 2015 pass rate ($k= 57$), 2016 pass rate ($k= 58$) and 2017 pass rate ($k= 7$). The choice of academic achievement measure was a significant moderator of the correlation between SES and academic achievement, $Q_b(4, 167) = 884.21$, $p<.001$.

Table 1; Association of Social Economic Status (SES) and academic performance

Moderator	Categories	K	Q-Between	Mean ES	−95% CI	+95% CI
Type of SES		79	587.14*	.32	.32	.33
Components						
	Age	30		.30	.30	.31
	Sex	15		.28	.26	.29
	Level of access	14		.29	.27	.31
	Electricity	10		.33	.32	.34
	Use of internet	6		.25	.22	.28
	Computer software use	4		.51	.49	.53
SES range		102	238.65*	.32	.32	.33
Restriction						
	No computers	78		.35	.35	.36
	Number of Teachers	15		.28	.28	.29
	Challenges of ICT	9		.24	.22	.27
SES internet source		62	775.55*	.29	.28	.30
	Home	31		.38	.37	.39
	Internet	18		.19	.19	.20
	School	13		.24	.21	.26
Achievement		167	884.21*	.29	.28	.29
Measures						
	2015 pass rate	45		.22	.22	.23
	2016 pass rate	58		.32	.32	.33
	2017 pass rate	57		.35	.34	.36

Note. k =number of effect sizes; ES=effect size; CI=confidence interval for the average value of ES. *$p< .005$.

3.2 ICT Infrastructure for Computer studies at Chamunda Secondary Schools

The tables below represent statement on ICT infrastructure and other computer related activities. The statement uses a 5 point Likert scale that ranged from strongly disagree, disagree, undecided, agree and strongly agree. Most of the students agreed that the school allowed learners to have access to computers.

Table 2: Importance of ICT infrastructure and access

Statements	Strongly disagree%	Disagree%	Undecided%	Agree%	Strongly agree%
The school allows access of computers to learners	12	4	6	70	8
The number of computers influence the average hours per week computers are available to you.	0	0	0	10	90
Level of access and use of e-mail and educational website enhances learning/teaching.	3	3	12	80	2

In table 7, it shows the computer studies teaching. 75% of the respondents strongly disagree that number of hours used in teaching computer studies lessons is sufficient. 80% of the respondents said that there was a presence of educational software such as Microsoft Power Point and all the respondents indicate that Computer studies is taught as a subject.

Table 3: Computer studies teaching in schools

Statements	Strongly disagree%	Disagree%	Undecided%	Agree%	Strongly agree%
Number of hours used in teaching computer studies lessons is sufficient.	75	5	10	5	5
There is presence of educational software such as Microsoft Power Point.	0	5	5	10	80
Computer Studies is taught as a subject.	0	0	0	0	100

3.3 Challenges in the use of ICT among learners

There are many challenges affecting teaching and learning of Computer Studies and how this may consequently affect the performance of learners in schools. Some of the revealed challenges in this study; 80% participants indicated that policy and strategy of government and school enhances use of computers in teaching and learning of computer studies. 80% strongly disagree that the number of computers available to the school is sufficient for teaching and learning of computer studies.

Table 4: Challenges affecting teaching and learning of computer studies

Statement	Strongly disagree	Disagree	Undecided	Strongly agree	Disagree
Policy and strategy of government and school enhances use of computers in teaching and learning of computer studies	5	5	5	80	5
The number of computers available to the school is sufficient for teaching and learning of computer studies	80	10	10	0	0

When it came ICT supporting teaching and learning of computer studies. 40% disagree that there is an increase in teacher learner collaboration, while 70% of the participant's indicated that the level of ICT use in computer studies has a direct impact on learner performance in examinations. Participants indicated that 80% use of ICT in computer studies has a positive impact on learner performance in examination.

Table 5: Use of ICT in supporting teaching and learning of computer studies

Statement	Strongly disagree%	Disagree%	Undecided%	Agree%	Strongly agree%
There is increase in teacher learner collaboration	30	40	20	5	5
The level of ICT use in computer studies has a direct impact on learner performance in examination	0	5	5	20	70
Use of ICT in computer studies has a positive impact on learner performance in examination	0	0	10	10	80
ICT has an effect on perception and attitudes of learners in learning computer studies	5	5	20	40	30

Qualitatively the content analysis of the semi- structured interviews of in-depth and focus group interviews which attempted to answer objective four and five of the study namely, to explore perception of Computer Studies learning among learners and to identify challenges learners face as they learn Computer Studies. The description of the participants is followed by the presentation of the predetermined and emerging themes, derived from the thematic analysis.

3.4 Challenges faced by teachers

This study found that both teachers and students experience a number of challenges that impede the use of computers for teaching and learning. Teachers expressed computer illiteracy, lack of training to use computers and an overloaded syllabus as the main problems that prevent their use of computers to teach. On the other hand, students expressed poor access, poor computer skills and late onset of use of computers as some of the reasons why they do not use computers to learn The responses of teachers in the open ended questions indicates that teachers were concerned about the depth and breadth of their own computing subject knowledge, and in particular that of computer studies. Teachers express the worry *"...that my own subject knowledge is not always secure"*.They also report that they have spent hours of their own time trying to upgrade the skill in the subject:

D09: *"...sometimes I spend my own time trying to develop my competencies so that I can deliver quality lessons for students because there is limited material and exposure to computers in our setting, especially internet is a problem ... "*

Teachers report that they have attended many training courses to build up their knowledge but still lack confidence in solving problem that students would come across:

D02: *"At the moment it is my own foundation knowledge about the construction of solutions to problems I have worked through several training booklets and courses but it is just the ability to solve problems that the students would come across in the system that they are using."*

Differentiation is also a concern for teachers. In some cases this is because students have differing experience of computer studies based on their prior exposure:

D10: *"The different abilities of students especially when they come in from primary... some are well-versed in computer studies and other not and this is a difficult when you try to teach them."*

In other cases, teachers referred to some students progressing faster than others and the gap between their students widening, making more differentiation necessary:

D11: *"The gap between those that engage and achieve very quickly grows at an alarming rate. I have found the ability gap to be much bigger than any other subject or topic and it seems to be down to the way in which the children think." without losing the less able pupils..."*

Teachers need to find pedagogical approaches that support their students. They express the challenge of developing, promoting and sustaining problem-solving strategies and techniques amongst the students they teach. They demonstrate their desire to find ways to help students work through problems rather than give up:

D02: *"...finding ways to encourage pupils to logically think through their problems, rather than ask for assistance at the first sign of difficulty."*

Although not frequently mentioned, some teachers referred to literacy difficulties as a stumbling block when learning to code:

D03: *"Literacy is a big issue when teaching computing; this has been the main stumbling block when trying to introduce variables, functions etc. "*

3.5 Challenges relating to resources

The analysis of teachers' qualitative responses, highlight a variety of resource related challenges which include possessing adequate hardware and software resources to teach the subject, sufficient funding to purchase resources for a new subject, and software resources correctly installed, configured and maintained to run correctly on the platform that the school operates.

3.6 Availability and accessibility of computer studies resources

This study found that computers were available and accessible to teachers and learners but were not largely being employed in the teaching and learning of Computer Studies. This implies that availability of computers was not the only challenge although it was previously viewed as a big challenge.

D05: *"we face a big challenge for a lack of computers in our schools and this makes it difficult for us to learn computer studies"*

IV. DISCUSSION

This study revealed that there are three teachers at Chamunda Secondary School who help to teach computer studies all of whom are not trained in the subject. Two female teachers are trained to teach computer studies and a male teacher is trained to teach Mathematics. This presents a controversy when it comes to teaching computer studies as teachers do not have the skills needed to teach the subject effectively. This becomes the major contributor to the poor performance of learners at Grade 9 in final examination in computer studies at Chamunda Secondary School. Hennesssy (2010) supports that teacher's ICT skills and access to professional development play a significant role in conducting successful lessons in computer studies. For efficient teaching of Computer Studies

to learners, there should be adequate personnel that have correct skills to handle the subject well.

This study revealed that training and teacher experience in ICT support teaching and learning computer studies and has a lot of benefit using ICT in enhancing skills and competencies of learners in computer studies respectively. 80 % of pupils agreed that the number of teachers with ICT training affect the use of computers in teaching and learning of computer studies, while 81% agree that the level of expertise in ICT directly influence quality of teaching computer studies and all the pupils strongly disagreed that there is use of internet for teaching and learning purpose. The results also revealed that the head teacher at this school was concerned with the shortage of ICT trained teachers. The school is big with about 500 pupils rationing to only three teachers of ICT. The head of school said that the three ICT teachers also need training as their qualifications show other teaching subjects and not ICT. These teachers were at Chamunda in that they did some partial certificate in ICT and have some knowledge in computer use. The Head teacher seriously pointed on the need by the government of the republic of Zambia to engage itself in the training of ICT teachers as there is lack of ICT trained teachers in public schools.

The teachers explained that the number of pupils is so large that the three of them cannot manage to handle all the school pupils efficiently. They attributed pupil's poor performance in Computer Studies to this as they don't spend enough time with the pupils teaching them Computer Studies as a subject as they also have other duties to do in the school. The head teacher said that other teachers have resisted volunteering to teach computer studies as they are not trained and hence some grades they do not learn computer studies due to shortage of trained teachers. The head teacher explained that we could like to see a situation where a child starts to learn computer studies from grade one up to grade nine so that when they come to Secondary School it is easy for them to grasp some concepts easily, but it has not been like this due to shortage of trained teachers and ICT infrastructure. Gurevich&Gorev (2012)also identifies low number of qualified teachers being among the factors that adversely affected the performance of learners in Computer Studies. Successful teaching of Computer Studies can only be assured through qualified personnel in the subject. This study established that there is lack of trained ICT teachers at Chamunda Secondary School in Masaiti District of Zambia and this attributes to the poor performance of Grade 9 learners in computer studies at final examination.

The research findings revealed that more than ¾ of the students (81%) have a positive attitude towards ICTs, although, male students (50%) are of greater support than female students (50%). This is supported by Morgan (1956) who argued that females are less experienced with ICT's and are more likely than males to have negative attitudes towards computers. Moreover, Tondeur (2006) examined some males

and females about their interest in internet use and discovered that there was a great difference on the interest level between the two groups. Male respondents showed to be more interested in internet services and use more than female. As such, students feel that appropriate use of ICTs would have a positive impact on their study habits, and can help them improve on their academic performance. The results on table 4. 5.1 show that majority of the pupils 60% strongly agreed that Computer Studies learning promises a better future career, 70% of the pupils strongly agreed that Computer Studies learning is for the boys, 100% of the pupils strongly agreed that Computer Studies learning helps learning of other subjects, 70% of the pupils strongly agreed that Computer Studies learning improves academic performance and 80% of the pupils strongly agreed that Computer Studies learning helps make school work easier.

V. CONCLUSION

This study found that both teachers and students experience a number of challenges that impede the use of computers for teaching and learning. Teachers expressed computer illiteracy, lack of training to use computers and an overloaded syllabus as the main problems that prevent their use of computers to teach. On the other hand, students expressed poor access, poor computer skills and late onset of use of computers as some of the reasons why they do not use computers to learn It was found that students who use computers almost every day have significant higher achievement scores than those who use computers in moderate or low frequencies. These results suggested that simply increasing the educational input on computers at school may not produce the desired effect; instead, the quality of teaching also matters.

VI. RECOMMENDATIONS

This study will hopefully provide a starting point for looking into the Academic performance of Grade 9 learners in Computers Studies so as to better future performance in the subject. The following were the recommendations of this study:

There is need for the Ministry of Education to employ qualified teachers to offer Computer Studies at Chamunda Secondary School. The Ministry of Education should adequately fund the school to purchase enough ICT equipment like computers, adequate learning and teaching materials and build computer labs.

This study showed limited resources at Chamunda school, with only 10 computers for all students with computer ratio to student of 1:3. Lack of trained teachers was also an issue. In address the growing challenges faced by teachers and students in availability of ICT resources, purchase of computers and learning software should be budgeted for in order to avoid reliance on donated computers and software.

During holidays the District Education Board Secretary in collaboration with the Head teacher should organize Continuous Professional Development (CPD) in the

school and invite trained personnel from other schools to enlighten teachers at Chamunda Secondary School in Computer Studies especially topics which they find difficult to teach.

VII. DECLARATIONS

7.1 Consent for publication

Consent for publication was communicated via the consent form.

7.1.1 Availability of data and material

The data for the study is readily available upon request from the authors.

7.1.2 Competing interests

There are no competing interests declared for this study.

7.1.3 Funding

This study did not receive any external funding

7.1.4 Author's contributions

Conception and design of the study was done by BMC. Data analysis was done by BCC. The Manuscript was done by all authors. Both authors approved the final submission of the manuscript before submission.

7.1.7 Acknowledgments

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