



Investigating Mathematics Teachers' Preparedness to Teach Computer in Secondary Schools of Kitwe District

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Abstract: This study is an investigation that focuses on finding out whether teachers of Mathematics have acquired enough preparedness to teach Computer in a way that will enhance academic learner performance. Although much research has been done on factors about ICT integration and implementation, little research has been done on preparedness to teach Computer as a topic integrated in the Mathematics syllabus. A total of sixty nine (69) teachers from eighteen different schools participated in the study including lesson observations which were carried out on four (4) teachers of different schools. The study used both quantitative and qualitative methods. The results through the questionnaires by the ANOVA test revealed that the difference between training and preparedness to teach Computer were not statistically significant ($P > 0.05$). The findings further revealed teaching experience were not a factor on preparedness to teach Computer. However, the findings by the paired sampled t test also revealed that Computer literacy and preparedness to teach Computer were statistically significantly different ($P < 0.05$). The results to determine the relationship between the preparedness variables by the correlation matrix about the population in the study and acquiring Computer literacy showed that they were not statistically significant ($P > 0.01$) except for training in ICT. The study, therefore, concluded that lack of Computer literacy affected teacher preparedness to teach Computer and negatively impacted on preparedness to understand the provision of material on Computer in the textbooks.

Keywords: Preparedness, Computer, ICT Integration, Mathematics Syllabus, Computer Literacy, Teaching Experience, Training in ICT, Academic Learner Performance

1. Introduction

The Ministry of General Education of the Republic of Zambia has introduced Computer studies in Secondary Schools. Some topics of Computer have been integrated into Mathematics at both Junior and Senior Secondary school levels. The Ministry has gone further to introduce Computer studies in the Business Department at secondary level as a Subject. The term Computer studies refers to the study of Computer Science meaning Computer algorithmic process, including their principles, hardware and software designs, their applications and the impact on society [13].

The introduction of Computers in Zambian schools had not only found to improve access to learning Computer Studies as a subject and quality knowledge delivery, however, its application could also have been useful to the teaching and learning process.

This may have improved learner's achievement in some subjects such as Mathematics where learner performance is low. ICT in this case could be an integral tool to mediate teaching and learning of Mathematics topics perceived to be difficult such as mensuration which contains three dimensional figures difficult to imagine and algebraic equations with numerical solution too large to compute [13].

A study to identify Zambian teachers' profiles of ICT use in Mathematics was carried out in Kabwe District of Zambia. The study analysed teachers' ICT skills, beliefs and attitudes towards the use of ICT in the teaching and learning of Mathematics. The analysis revealed that teachers in Kabwe District possessed ICT skills and had showed positive attitudes towards ICT integration in the Mathematics classroom. A significant difference between teachers overall ICT Math profiles and gender existed. The convergence of ICT at home and in schools has increased substantially over the last decade. Recommendations for further

research, policy and practice where proposed [15].

Teachers of mathematics who had acquired a skill in ICT have full confidence and understanding of each of the different types of Mathematics software. Most teachers felt that they lacked competence or confidence to do so effectively even though many teachers make regular use of ICT in the classroom. Teachers may readily admitted that they do not understand ICT fully and that there was generally little appreciation of the potential of ICT to enhance teaching and learning [5]. This research wanted to establish whether teachers of mathematics have the necessary Computer literacy to teach effectively the Computer topics in Mathematics.

The study, therefore, intended to find out the preparedness of Mathematics teachers to teach Computer topics. The research seeks to understand the relationship between trained Mathematics teachers with the knowledge of how to teach mathematics together with accompanying technological knowledge and the preparedness to teach Computer topics. The implications of this study was assumed may assist educators to understand practical issues involved in teaching Computer topics in Mathematics in order to enhance learner academic performance and preparation for further studies.

Some Mathematics teachers have no confidence that they can teach computer even though they visit the ICT room. The lack of proper teaching methodologies by the teachers of ICT may lead to producing a less skilled student which may affect the future competence of the learners when pursuing further studies involving the Mathematics software [7].

1.1. Problem Statement

A Component on Computer has been integrated in the Zambian Mathematics School Syllabus from grade eight to twelve and schools have spent resources relevant teaching materials to mitigate the challenge of teaching the topic. Therefore, real solutions should be availed to secondary schools in Kitwe district as teachers of Mathematics with a teaching experience of at least 20 years were assumed not have received training in ICT at college or university.

This study also sought to explore the gaps in research and sought to improve on the studies previously carried out on the similar subject.

A study on preparedness of Mathematics teachers' in transforming the teaching and learning of secondary school Mathematics; a case of Tigiana East District of Kenya, The study showed that teachers did not use the ICT resources that where available as they lacked knowledge on appropriate usage. The lack of pre-service and in-service training was a major limitation [16]. This study focused on the impact of training on preparedness to teach Computer.

There was also no known study which sought to explain the Mathematics teachers' preparedness to teach the Computer topics using the TPACK frame work of integrating ICT [10] in Secondary schools of Kitwe District.

1.2. Research Questions

1. What is the impact of training on Mathematics teachers'

preparedness to teach Computer in secondary schools?

2. What is the impact of Computer literacy on teachers of Mathematics preparedness' to use textbooks to teach Computer in secondary schools?
3. What is the relationship between the preparedness variables to teach Computer and teachers of Mathematics acquiring Computer literacy?

1.3. Significance of the Study

The study intends to determine the significance of having trained teachers of Mathematics with the necessary skills in ICT to impart knowledge and eventually improve learner performance in schools. The findings of the study may also help the Ministry of General Education and policy makers to make informed decisions on how best teachers of Mathematics can be helped to be equipped with tools needed to prepare for lessons when teaching the Computer topic in Mathematics. Finally, the study focuses on Human resource development for Mathematics teachers teaching computer studies and the integrated Computer topic in Mathematics in order to enhance learner performance.

1.4. Theoretical Framework

The theory that will inform this research is the TPACK framework for ICT integration which was introduced by Mishra and Koehler [10]. The TPACK framework emphasises how connections among teachers' understanding of content, pedagogy and technology interact with one another to produce effective teaching. Shulman [19] proposed that effective teaching requires a special type of knowledge: Pedagogical Content Knowledge (PCK) that represents the blending of content and pedagogy into understanding of how particular topics, problems or issues are organised and represented to the diverse interests and abilities of learners. Mishra and Koehler [10] states that the formulation of Technological, Pedagogical and Content Knowledge (TPACK) frame work extended Shulman's [19] characterisation of teacher knowledge to explicitly consider the role that knowledge about technology can play in effective teaching.

1.5. Conceptual Framework

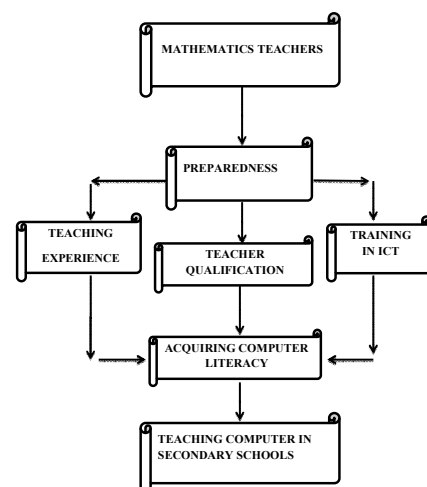


Figure 1. Conceptual framework showing the Mathematics teachers' preparedness to teach Computer in secondary schools of Kitwe District.

2. Methodology

2.1. Research Design

The cross sectional survey research design was used to conduct the research in Kitwe district of Zambia located on the Copperbelt Province. The researcher adopted the quantitative method. The researcher chose this research design because of the advantages of collecting data; it is also the simplest and least cost alternative compared to longitudinal survey [17].

2.2. Study Population and Sample Size

Eighteen Secondary schools where part of the cross sectional survey. The target population included all Mathematics teachers in secondary schools of Kitwe district. However, 69 questionnaires out of the 87 questionnaires distributed where completed by the respondents consisting of 46 male and 23 female and four lesson observations from 4 teachers of different schools were conducted during the study.

2.3. Sampling Methods

The sampling technique used in the survey to select participants was the stratified random sampling. The sampling technique was used in order to have equal proportion according to gender of participants in the sample of mathematics teachers teaching Computer in secondary schools of Kitwe district. Random selection was used to select schools and participants in the research.

2.4. Data Collection Methods/Techniques

The questionnaires and observations were used to gather primary data from teachers for this research study. These instruments were carefully crafted and constructed

to reduce on being biased in order to have validity and reliability. A questionnaire was used because it captures data of a sizeable population within a short period of time. The primary data collected through the questionnaires were both quantitative and qualitative. The closed and open-ended questions in the questionnaire were used to obtain data. The responses were completely anonymous, allowing potentially embarrassing questions to be asked with a fair chance of getting a true reply [20]. The questionnaires were collected through the School Head at an agreed upon date. To help validate data an observation was made on four teachers who taught a topic on Computer. Four teachers were carefully purposefully selected for observation where two were trained in ICT and the other two were teachers of Mathematics who were not trained in ICT. The teachers were informed about what they were expected to teach and that data collected were to be used for research purpose.

3. Presentations of Findings

The results of the research are presented in three sections based on the research questions.

3.1. Investigating the Impact of Training on Mathematics Teachers' Preparedness to Teach Computer

The first objective of the study endeavoured to investigate the preparedness to teach Computer by the type of training Mathematics teachers previously received in secondary schools. Findings of the study through questionnaires revealed that 45 Mathematics teachers suggested preparedness to teach Computer through formal training in ICT, 15 acquiring Computer Literacy, 6 through teaching experience and 3 without training in ICT.

Table 1. Mathematics teachers' suggestions on the type of training leading to preparedness to teach Computer.

Number of Teachers	Responses
45	Training in ICT
15	Acquiring Computer Literacy
6	Teaching Experience
3	Need no for training in ICT or Computer
Total 69	

Table 1 shows that 62.3% of the respondents expressed preparedness to teach Computer in mathematics through training in ICT, 24.6% through acquiring Computer Literacy, 8.7% through teaching experience and 4.3% no need for training in ICT or Computer.

3.1.1. Types of Training for Mathematics Teachers

To find out the preparedness of Mathematics teachers' to teach Computer by the previous training received at their respective colleges or through undertaking personal computer short data was collected using questionnaires. Teachers gave responses regarding the type of training previously received and those who did Mathematics without Computer courses

where the highest at 34.8% and followed by those at 29% with Mathematics and Computer courses at college or university respectively. The lowest percentage was recorded for those who did personal short Computer courses without Mathematics at 4%. The results show from the cumulative frequency percentage that 65.2% of teachers of Mathematics had acquired Computer Literacy through training.

An ANOVA test was conducted on the difference between the five groups of the number of teachers of Mathematics representing the types of training and preparedness to teach Computer.

H_0 : There is no statistical significant difference between the mean scores of five groups of the types of training by

teachers of Mathematics and preparedness to teach Computer in secondary schools.

H_A : There is a statistical significant difference between the

mean scores of five groups of the types of training by teachers of Mathematics and preparedness to teach Computer in secondary schools.

Table 2. One way ANOVA test for the Preparedness of teachers of Mathematics to teach Computer by the training previously received. $N=69$.

Source	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.059	4	.265	.210	.932
Within Groups	80.709	64	1.261		
Total	81.768	68			

Table 2 revealed that the difference in mean scores between the five groups representing the type of training previously received by teachers of Mathematics and preparedness to teach Computer was not statistically significant.

The results implied that type of training teachers of Mathematics previously received had no factor on preparedness to teach Computer.

3.1.2. One-way ANOVA Test Conducted on Teachers of Mathematics Preparedness to Teach Computer with Type of Training by Teaching Experience

To analyse the differences between the type training groups and three groups representing preparedness to teach

Computer according to teaching experience namely; (0-10) years, (11-20) years and (21-30) years the Analysis of Variance was used.

The following hypothesis was tested at $p = 0.05$

H_0 : There is no statistical significant difference between the mean scores of three groups of teaching experience and preparedness by the type of training to teach Computer in secondary schools.

H_A : There is a statistical significant difference between the mean scores of three groups of teaching experience and preparedness by the type of training to teach Computer in secondary schools.

Table 3. One way ANOVA for Preparedness by Teaching Experience and the type of training of teachers of Mathematics ($N=69$).

Source	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5.003	2	2.502	2.183	.121
Within Groups	75.634	66	1.146		
Total	80.638	68			

The results in Table 3 show that $F=2.183$ and $P>0.05$. The results of the F-ratio shows that the research hypothesis is not statistically significant. Therefore, we fail to reject the null hypothesis and conclude that there is no statistical significance difference between the mean scores of the three groups representing preparedness by teaching experience and preparedness by the type of training teachers of Mathematics received to teach Computer.

3.1.3. Lesson Observations on Preparedness to Teach Computer

The results in Table 4 show the outcome of observations on four teachers to ascertain their preparedness to teach Computer. 'Teacher A' and 'Teacher C' were trained in ICT and had a teaching experience of 8 years and 5 years respectively whereas 'Teacher B' and 'Teacher D' were not trained in ICT and had a teaching experience of 10 years and 28 years respectively.

As can be seen in Table 4 the results show that 'Teacher A' and 'Teacher C' had the highest scores (21 and 22 out the score of 35 for obtaining an outstanding result in all the categories) at 60% and 63.6% respectively which is more

than fifty percent of the total score (35) for preparedness to teach Computer. The table revealed that Lesson preparation had the highest scores with a total of 14 indicating that teachers had adequately prepared for the lessons with appropriate objectives in the lesson plan and teaching materials. It must be noted, however, that 'Teacher B' and 'Teacher D' had low scores at 40% and 31.4% respectively out of the total score of obtaining an outstanding result in all the aspects representing preparedness indicating that the lack of training in ICT was a factor on teacher preparedness to teach Computer. 'Teacher D' who had more experience (28 years) than the other teachers obtained the least number of total scores indicating that teaching experience was not adequate to enable the teacher to teach Computer in contrast to 'Teacher C' with the least experience (5 years) who had the highest score indicating that the introduction of ICT to the Teacher Education Curriculum has yielded positive results. The results in Table 4 were also analysed using the standard frequency of the scores using the observations sheets of the four teachers as shown in Table 5.

Table 4. Outcome of observations to ascertain preparedness to teach Computer.

TEACHER					
PREPAREDNESS	A	B	C	D	TOTAL
Lesson Preparation	4	4	4	2	14
Organisation of the lesson	3	2	4	2	11
Knowledge of the Computer topic	4	2	4	1	11
Variety of ICT related activities and appropriateness	3	3	4	1	11

TEACHER					
PREPAREDNESS	A	B	C	D	TOTAL
Involvement of learners in the lesson.	3	1	2	2	8
Individual attention to learners	2	1	2	2	6
Teaching Resources in Computer	2	1	2	1	6
TOTAL	21	14	22	11	70

Key to standard: 1-unsatisfactory, 2-satisfactory, 3-good, 4-very good, 5-Excellent.

Table 5. The Standard Frequency scores for preparedness to teach Computer.

Standard Frequency					
Preparedness	1	2	3	4	5
Lesson Preparation	0	1	0	3	0
Organisation of the lesson	0	2	1	1	0
Knowledge of the Computer topic	1	1	0	2	0
Variety of ICT related activities and appropriateness	1	2	1	0	0
Involvement of learners in the lesson.	1	2	1	0	0
Individual attention to learners	2	2	0	0	0
Teaching Resources in Computer	2	2	0	0	0
Total	7	12	3	6	0

Key to standard: 0-absent, 1-unsatisfactory, 2-satisfactory, 3-good, 4-very good, 5-Excellent.

From Table 4 it can be seen that three out of the four teachers scored 4 (very good) and were able to prepare for their lessons adequately. The table reveals that the teachers exhibited some levels of competence in the organisation of lessons and the knowledge of the Computer topic taught in their particular lessons by scoring at least 2 indicating that the lesson development from the introduction to conclusion was above average. It can also be noted that, however, most of the teachers scored 2 (satisfactory) which was an average score indicated that the teachers were facing difficulties in most of the areas of preparedness to teach Computer. The results in Table 4 shows the scores of less than 4 for the involvement of learners in the lesson and individual attention to learners indicating that there was little participation of learners in the lesson and teachers did not attend adequately to individual learners facing challenges in the Computer topic. The Table reveals that schools scored less than 3 (satisfactory and unsatisfactory) on teaching resources which showed that the nature of resources were not appropriate to teach Computer, there was no variety of teaching and learning resources and the textbooks were not enough in the Mathematics classroom.

3.2. Investigating the Impact of Acquiring Computer Literacy by Teachers of Mathematics on Preparedness to Use Textbooks

The second objective of the study endeavoured to determine the difference between Mathematics teachers' preparedness by acquiring Computer literacy and using textbooks to teach Computer. The number of teachers of Mathematics is shown in Table 6 according to how they responded in the questionnaire on preparedness to teach Computer.

3.2.1. Analysis of Paired Sample t Test Done on Teachers of Mathematics with Computer Literacy and Those Using Textbooks

H_0 : There is no statistical significant difference between the mean scores of acquiring Computer literacy by teachers of Mathematics and preparedness to use textbooks to prepare teach computer in mathematics.

H_A : There is a statistical significant difference between the mean score of acquiring Computer literacy by teachers of Mathematics and preparedness to use textbooks to prepare teach computer in mathematics.

Table 6. Comparisons between acquired Computer literacy and preparedness to use textbooks to teach Computer in Mathematics (N=69).

Preparedness	N	Mean	Std. Deviation	T	Df	P
Computer literacy	69					
Use of Textbooks	69	0.507	0.073	6.915	68	0.000

The results in Table 6 show that $P < 0.05$ which is statistically significant. Hence, we reject the null hypothesis and conclude that there was a statistical significant difference between mean scores of acquiring Computer literacy and textbooks on preparedness to teach Computer.

The study established through a paired sample t Test that acquiring Computer literacy and using text books was a factor on Mathematics teachers' preparedness to teach computer in mathematics.

3.2.2. Lesson Observations on Computer Literacy Skills for Teachers

The four teachers were observed in order to find out what Computer literacy skills they were able to demonstrate. Table 7 shows the frequencies of scores on some of the Computer literacy skills demonstrated by the teachers during the observations.

Table 7. Computer literacy skills for teachers of mathematics by the standard frequency scores.

Standard Frequency					
Computer literacy skills	1	2	3	4	5
Accuracy of material presented on Computer	0	1	2	1	0
Level and relevance of material to Computer	0	2	2	0	0
Logical presentation of concepts	0	2	1	1	0
Application of concepts on Computer Software	2	2	0	0	0
Total	3	7	5	2	0

Key to standard: 0-Absent, 1-Unsatisfactory, 2-Satisfactory, 3-Good, 4-Verygood, 5-Excellent.

The results in Table 7 shows that the learners were presented with accurate material on Computer by their teachers who scored at least 2, therefore, exhibited some level of competence when presenting the topic on the board. A problem is noticed on application of Computer concepts on Computer software were teachers scored less than 3 which is satisfactory and unsatisfactory. The table further reveals that teachers scored 2 in most cases which satisfactory indicating that Computer literacy was not adequate in the teachers. The table also reveals that the teachers scored less than 5 in all the four aspects indicating that the standard of acquiring Computer skills was not excellent.

Furthermore, it was observed that teachers expressed anxiety and fears to prepare a lesson to teach Computer. This would

imply that the teachers were not exposed to practical activities involving ICT in order to acquire Computer Literacy skill.

3.3. Interpretations of the Correlation Matrix for the Preparedness Variables to Teach Computer in Mathematics

A correlation test was carried out to establish the relationship between the preparedness variables to teach Computer and acquiring Computer literacy. The preparedness variables included ICT Training, the teaching experience and qualifications of teachers in secondary schools. The data is tabulated in Table 8.

Table 8. Correlation matrix for the preparedness variables to teach Computer (N=69).

Variables		1	2	3	4
Computer Literacy	Pearson Correlation	1	.384**	-.209	.002
	Sig. (2-tailed)		.001	.085	.989
Trained in ICT	Pearson Correlation	.384**	1	.071	-.148
	Sig. (2-tailed)	.001		.565	.226
Teaching Experience	Pearson Correlation	-.209	.071	1	-.149
	Sig. (2-tailed)	.085	.565		.222
Qualifications of teachers	Pearson Correlation	.002	-.148	-.149	1
	Sig. (2-tailed)	.989	.226	.222	

**Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix in Table 8 contains 12 bivariate correlations that were computed between the three preparedness variables to teach Computer in mathematics and acquiring Computer literacy. Each of the resulting correlation was subjected to separate statistical test and the results of a correlation test indicated that only 1 out of 12 bivariate correlations turned out to be significant ($P < 0.05$) and 11 bivariate correlations were not statistically significant ($P > 0.05$). This implies that there is no statistical significant relationship between the preparedness variables to teach Computer in Mathematics and acquiring Computer literacy about the population associated with a single sample of 69 Mathematics teachers used in the investigations. However, results showed that there was a significant positive relationship between preparedness through training in ICT and acquiring Computer literacy.

4. Discussion

4.1. Investigating the Impact of Training on Mathematics Teachers' Preparedness to Teach Computer

The study endeavoured to investigate the impact of the

type of training by teachers of Mathematics on preparedness to teach Computer. The findings through the suggestions given on type of training which lead to preparedness to teach Computer indicated that 62.3% through ICT training, 24.6% through acquiring Computer literacy, 8.7% through teaching experience and 4.8% needed no training in ICT or Computer. The results revealed that the majority of the teachers are prepared to undergo training in ICT for the purpose of teaching Computer effectively in the Mathematics Classroom. The study on infusion of ICT the teaching and learning of Mathematics revealed that teachers do not consider themselves to have basic skills to effectively integrate ICT in Mathematics and the study also reveal that majority of teachers have positive attitudes towards the general role that ICT can play in education. However, teachers do not consider themselves qualified to effectively integrate ICT into instruction [12].

The results of comparisons among the five groups representing the type of training on Mathematics teachers' preparedness to teach Computer were not significantly different. The results reveal that the type training teachers of Mathematics obtained were not a factor on preparedness to

teach computer in Mathematics. The results again revealed that the teaching experience for teachers of Mathematics in this study were not factor on preparedness to teach Computer in Mathematics regardless of the type of training obtained. The findings of the results on comparisons among the groups of teaching experience concluded that teachers of Mathematics possessed the required preparedness to teach Computer in Mathematics with the type of training obtain. The results are contrary to the suggestion that the young generation were becoming familiar with the use of technology, since they had understood that it was the demand of the present era, but old people thought they can spend the rest of their lives without using technology.

The findings of lesson observations conducted from all the schools sampled in the study, clearly showed that teachers of Mathematics already serving in schools have a potential to teach Computer more effectively when given enough training in ICT if they are availed with opportunity. The results in Table 5 showed that all teachers of Mathematics scored at least a satisfactory on lesson preparation which was very good by the scale, indicated that the claims by teachers in the questionnaires that training was not a factor were a mere assumption according to the findings during the lesson observations. Worse still, the assumption that teaching experience was not a factor contradicted with the results obtained during observations on the teacher who had served for more than 20 years. The teacher with more experience had low total scores compared with the other teachers who had served less than 5 years in all aspects of preparedness to teach Computer during the lesson observation. In this regard, preparedness to teach Computer can only be acquired and developed by ICT training and acquiring Computer literacy. Mulenga and Phiri [15] argues that it was logical to conclude that the ICT Maths profiles of teachers improve as teachers of Mathematics gain more teaching experience because the more they are exposed to ICT training on their Professional and career development and the more teachers integrate ICT into Mathematics.

4.2. Investigating the Impact of Acquiring Computer Literacy by Teachers of Mathematics on Preparedness to Use Textbooks

Mathematics would equip the learner to live in modern age of science and technology and enable the learners to contribute to the social and economic development of the country and the world at large. Mathematics also prepares and enhances the learner's prospect of employment and further education as it plays a key role as a tool for other learning areas and subjects. Mathematics plays a pivotal role in the development of highly skilled and technologically based man power. Use of Mathematics related software should be encouraged and the teacher should encourage learners to use available Mathematics software [14]. The results in the study showed that 42% expressed their preparedness to use the Computer software, 50.7% were not sure about Computer software and 7.3% expressed that the Computer software was not useful to teach Computer. The

results, therefore, suggest that the majority of Mathematics teachers were not sure about the use of Computer software.

The results in the study on responses of teachers of Mathematics on preparedness to teach Computer showed that 85.5% were positive about the understanding of content in the textbooks, 78% expressed preparedness to teach Computer with the type of training previously received, 43.5% with acquired Computer literacy and 33.3% with the availability of teaching resources in schools. The findings of the results revealed the type of training with or without ICT training was enough for Mathematics teachers to express their preparedness to teach Computer.

The results further indicated that the Textbooks available were perceived to have sufficient and well explained content for Mathematics teachers' Preparedness to teach Computer. However, the lack of basic Computer literacy in some teachers in the study made them to perceive preparedness to teach Computer as unattainable. Furthermore the resources in schools were perceived not enough for teachers to express preparedness to teach Computer. The findings according to Abelson Harold and Susman Gerald [1] state that the international acclaimed textbooks provide a comprehensive introduction to the modern study of Computer algorithms. It covers a broad range of algorithms in depth, yet makes there design and analysis accessible to all levels of readers. Each chapter is relatively self-contained and presents an algorithm, a design, technique, an application area or a related topic. The algorithms are described and designed in a manner readable by anyone who has done a little programming. The explanations have been kept elementary without sacrificing the depth of coverage or Mathematical rigour.

The results in the study showed that over 50% of teachers of Mathematics expressed that teachers were prepared to teach Computer. A slight smaller percentage of teachers at 17.375% were uncertain whether they were prepared or not. This implied that the teachers of Mathematics are prepared to teach Computer although there was need to make available tools of preparedness for effective teaching. The teachers believed that they would make use of ICT in their lessons if there was a pool of ICT based Mathematics ready to use resources, easily and readily accessible to them and clearly mapped to the objectives of the scheme of work. Teachers are of the view that raising awareness level on the value of ICT in the teaching and learning of Mathematics would increase the integration of ICT in their teaching. Furthermore, teachers would like a programme for use of ICT as medium of instruction across the curriculum [12]. According to Mishra and Koehler [10] formulation of technological, pedagogical and content knowledge (TPACK) frame work extended Shulman's [19] characterisation of teacher knowledge to explicitly consider the role that knowledge about technology play in effective teaching.

The study established through a paired sample t Test revealed that acquiring Computer literacy was a factor on Mathematics teachers' preparedness to use textbooks to teach Computer. The findings of the study according to Baya'a and Daher [2] stated that factors relating to self -confidence

related to teacher self-confidence regarding the use of technology in order to understand deeply the hardware and software needed to use in the ICT classroom.

The findings from questionnaires were consistent with the claims that Computer literacy was a factor on preparedness to teach Computer according to the results obtained through observations from actual practical lessons. Furthermore, it was observed that teachers expressed anxiety and fears to prepare a lesson to teach Computer. This would imply that the teachers were not fully exposed to practical activities involving ICT in order to acquire Computer literacy. The Ministry of Education, Science, Vocational Training and Early Education [14] in the document *Zambian Education Curriculum Framework* notes that due to the shortage of trained teachers in ICT the learners were taught Computer topics by teachers of Mathematics who previously may not have received training in ICT.

4.3. Investigating the Relationship Between the Preparedness Variables and Acquiring Computer Literacy to Teach Computer

The research discussed the following preparedness variables; ICT training, teaching experience and qualifications of teachers. The results showed the highest negative response were on training in ICT and acquiring Computer literacy at 60.1% and 63.8% respectively. The results indicated that there was need to expose teachers to Computer training for those teaching in schools through CPD's and SMARC Meetings. Teachers should also be given space and time to access the Computer Laboratory to practice and eventually gain exposure on how to operate the Computers. Mathematics teachers lacked proper training in the use of ICT. It was observed that during training at both diploma and degree levels, teachers were not exposed to the use of ICT as a teaching resource in the subject. However, the teachers with degrees and diplomas were found to have some sort of ICT training and others attended Computer colleges on their own for personal reasons other than the use for teaching [16].

The results obtained using a correlation matrix for the three preparedness variables indicated that there was no statistical significant relationship between the preparedness variables to teach Computer about the population associated with a single sample of 69 Mathematics teachers used in the investigation and acquiring Computer literacy. Each of the resulting correlation was subjected to separate statistical test and the results of a correlation test indicated that only 1 out of 12 bivariate correlations turned out to be significant ($P < 0.05$) and 11 bivariate correlations were not statistically significant ($P > 0.05$). This implied that there was no statistical significant relationship between the preparedness variables to teach Computer and acquiring Computer literacy about the population associated with a single sample of 69 Mathematics teachers used in the investigations. However, results showed that there existed a significant positive relationship between preparedness through training in ICT and acquiring Computer literacy. The other indication is that

the relationship among the variables was weak. The study revealed that the implementation of teaching the Computer should be accompanied by investing in ICT training for teachers already teaching in schools. To mitigate the shortage of teachers in secondary schools the government through the Ministry of General Education has embarked on a programme of training teachers in Mathematics and ICT. Hence, exposing pre service trainee teachers in ICT to a wide variety of learning experience via the Computer would be a better approach. It is important that trainee teachers learn and practice the use of ICT in an educational context in particular their own teaching subject. Due to the few teachers trained to teach ICT the learners in secondary schools are taught Computer topics by teachers of Mathematics.

5. Conclusion and Recommendations

5.1. Conclusion

The investigation in the study revealed that the teachers of Mathematics' preparedness to teach Computer in secondary schools of Kitwe District were low and needed urgent attention. This is so because the findings through the questionnaires that training of teachers and teaching experience had no factor on preparedness to teach Computer contradicted with the results obtained during the lesson observations. The study according to Mulenga and Phiri [15] revealed that teachers in Kabwe district of Zambia had positive attitudes towards ICT use and the study indicated that everyday levels of ICT integration in Mathematics classrooms was still low. This study through the lesson observations revealed that teachers of Mathematics who previously were trained in ICT were more prepared to teach Computer than those without training. The study further revealed that lack of Computer literacy affected teacher preparedness to teach Computer. In addition, lack of Computer literacy had negatively impacted on preparedness to understand the content in the textbooks. This study is also supported by the TPACK framework emphasises on how connections between teachers' understanding of content, pedagogy and technology interact with one another to produce effective teaching.

5.2. Recommendations

In view of the findings in the study, the following are the recommendations:

- i. Ministry of General Education to accompany the implementation of teaching Computer with investing more in in-service training in ICT of teachers already teaching in schools.
- ii. Improve in the provision of material in the textbooks by introducing Computer practical activities for both teachers and learners in order assist them to acquire Computer literacy.
- iii. School Authorities should make sure that Computer laboratories are accessible to all teachers of Mathematics to enable them practice and acquire

Computer literacy to teach Computer effectively.

- iv. There is need for schools to acquire, a variety of ICT teaching resources to help both teachers and learners to have a variety of teaching and learning resources when teaching Computer.
- v. Revise the provision of material during the training of secondary school teachers by introducing activities of application of pseudo code and flow charts studied in Computer on Computer software.

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