



UNIVERSITY OF BOTSWANA

**THE USE OF COMPUTERS AND EXTENT OF COMPUTER INTEGRATION
IN THE LEARNING OF PRESCHOOL CHILDREN IN BOTSWANA.**

**MASTERS DEGREE PROGRAM
(PRIMARY EDUCATION)**

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A dissertation submitted to the School of Graduates Studies, University of Botswana in partial fulfillment of the requirements for award of the degree of Master of Education (Primary).

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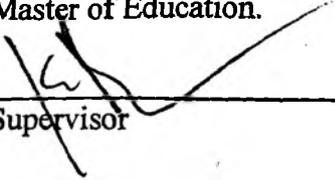


ACRONYMS

CBO-	Community Based Organization
CD-ROM-	Compact Disc Read Only Memory
DATEC-	Developmentally Appropriate Technology for Early Childhood
ECC&E-	Early Childhood Care and Education
HIV/AIDS-	Human Immunodeficiency Virus Acquired Immunodeficiency Syndrome
ICT-	Information and Communication Technology
NAEYC-	National Association for Education of Young Children
NCTM-	National Council of Teacher of Mathematics
NGO-	Non Governmental Organization
PC-	Personal Computers
SPSS-	Statistical Packaging for Social Sciences
UNICEF-	United Nations Children's Fund

Approval Page

This dissertation has been examined and is approved as meeting the required standards of scholarship for partial fulfillment of the requirements for the degree of Master of Education.



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STATEMENT OF ORIGINALITY

The researcher worked in this research project at the University of Botswana between August 2007 and August 2009. It is original work except where reference is made and neither has it been nor will it be submitted for the award of any other degree in any other university.

TOPIC: The use of computers and extent of computer integration in the learning of preschool children in Botswana.



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ABSTRACT

The study was intended to investigate the use and extent of computer integration in the learning of preschool children.

Literature showed that computers are widely used in the developed countries by preschool children. It also showed that it is important to integrate computers across the school curriculum during early years of learning and to use developmentally appropriate computer software, as this proved to improve the performance of preschool children. Studies had proved that children in Botswana preschools use computers. The importance of carrying out the study is to find out the strategies used by teachers to integrate computers and the relevance of the programs used to the children of Botswana.

The use of both qualitative and quantitative methodologies helped in answering questions to this survey. A questionnaire was administered comprising of both open and closed ended questions. Semi-structure interviews and observations were also used for data collection. The study involved twenty participants from 10 preschools in Gaborone, Botswana. The results indicated that despite the fact that there are computers in the preschools, not all children had access to them. Preschools were found to be using programs which were not developmentally appropriate to the culture of Botswana. Internet connection was non-existent for both teachers and preschoolers. The study also showed that computer integration was limited.

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CHAPTER 1: BACKGROUND TO THE STUDY

1.0 Introduction

This chapter provides a background of the problem which justifies why computer integration in infant classes is worth studying. The chapter discusses the statement of the problem, purpose of the study, research questions, significance of the study, definition of terms, limitations and delimitations.

1.1 Role of computers in society

All work that humans perform requires different apparatus to help them speed up operations. Some tools are used to help in measuring distance. For example, tape measures, while others supplement handwriting, an example being computers. In most countries, the computer has gained more use in education sector than being used just for word processing (i.e. as a data processing device, playing games and disseminating information through the internet). To emphasize this point, Wright (2001) is of the view that computers, video games, and the Internet have become entrenched features of our daily lives. Computer use has reached beyond work and is now a major source of fun and entertainment for many people. For most people, computer use and video game play is integrated into their lives in a balanced healthy manner.

The computer has moved into every facet of human life. It is widely used in work places and offices. It is used for a variety of purposes including purchasing goods at point of sales, writing letters and reports, playing games, designing art work, teaching and reading to children. Since most of the adult population in developing countries use computers in

one way or the other, the prediction is that its use will increase in the next generation (Next Generation Forum, 2000).

Due to the diverse functions performed by the computer, it is making an impact on education and in the classroom. Bahr and Johnston (2000) indicate that, for economic reasons the use of computers in primary and secondary schools has lagged significantly behind their adoption in homes and business. Meanwhile in universities, computers have long been the key tools for numerous forms of research. It is interesting to note that, while computers are so prevalent in upper-level education, they are largely ignored in preschools, despite the fact that children are growing up in a computer-literate world.

Nevertheless, computers have been shown to offer unique opportunities for learning through exploration, creative problem solving, and self-guided instruction during preschool education. Clement (1992) alleges that children (from age 3) approach computers with confidence and comfort, and appear to enjoy exploring them with minimal supervision. Computers and other Information Communication Technology (ICT) have been introduced into schools during early years for a variety of reasons, such as to begin preparing children for their future (Siraj-Blatchford I, & Siraj-Blatchford J, 2007).

1.2 Preschools Education in Botswana

Since the research is particularly about the use and the integration of computers in the preschools, it is important to examine the history of Early Childhood Care and Education

(ECC&E) in Botswana. A brief history of ECC&E in Botswana shows that the Day Care programs were started after independence by voluntary organizations such as churches, Red Cross, women's groups, and private individuals. In 1977 the Day Care Reference committee was established which consisted of representatives of the Ministries of Education, Ministries of Health, and Local Governments and lands, voluntary organization and religious groups. The committee decided that Day care centers should be under the Ministry of Local Government and Lands. Afterwards, day care centre guidelines were enacted in 1980 giving the Ministry of Local Government and Lands overall responsibility to oversee the Day Care centre program. Nothing has changed ever since. The preschools and day care centers are owned by private individuals, Community Based Organizations (CBOs), churches, Non Governmental Organizations (NGOs), institutions like universities and colleges, and Local government (council) yet licensed and governed by Ministry of Local Government and Lands (Republic of Botswana, 2001a).

There has also been an increased need, (a need identified as part of the recommendations of the Pan African Conference on Day-care centers program organized jointly by Economic Commission for Africa and UNICEF) for the training of personnel to be in charge of the increasing number of day-care centers in the country. In order to become conscious of this need, UNICEF agreed to erect a training centre in Lobatse for the training of Day-care teachers (Otaala, Njenga, & Monau, 1989). The Revised National Policy on Education recommended that the Pre-Primary Education Unit of Ministry of Education should be responsible for ECC&E policy formulation and also establish

standards for facilities and the quality of these programs, as well as monitoring of pre-school education (Republic of Botswana, 1997). To date the Ministry of Education and Skills development is the one responsible for early childhood & care program.

The importance of pre-school education has been a major debate. Kgoroba said:

Government of Botswana regards children as its most valued resources. It therefore, takes deliberate steps to ensure that relevant policies and programs are in place for their protection and nurturing. One such program is the Early Childhood and Care Education. (Republic of Botswana 2001a p. iii).

It is important to realize that now the government of Botswana recognizes the importance of learning of preschool children. Hence the government of Botswana is making an effort in order to improve their education. Information and Computer Technology (ICT) plays an important role in global technological era and as such should also be seen as the need in the learning for young children (Bose and Tsayang, 2005). Government, through the Ministry of Education, Ministry of Health and Local Government should give grants to centres established by communities to sustain them (Republic of Botswana, 2001a). These bodies, which form part of government, sit together in making policies advocating for ECC&E. It is these bodies that should see to it that computer integration is paramount during policy making, should request for money from government to include computer integration in the curriculum for pre-school children. However, the absence of a curriculum for preschools may make it difficult to integrate computer education in early childhood education.

The document of Ministry of Local Government (Republic of Botswana, 2003) stipulates that it is the responsibility of Ministry of Education to formulate the policy while the Ministry of Local Government is responsible for policy implementation with regard to the preschools. It is necessary that the Ministry of Education should provide enabling environment through preschool grants to the Non Governmental and Community Based Organizations as well as coordination and professional support of the program. With enough financial support provided to existing preschools the facilities such as computers and developmentally appropriate programs should be easily accessible or provided to all children.

The ECC&E policy document (Republic of Botswana, 2001a) suggested that government should provide an enabling environment for the development of ECC&E program. It encouraged councils, NGO, community groups and individuals to develop services that reflect the appreciation of vision 2016 which calls for a just and caring nation. It is vital to reinforce child development through cultural and recreational activities. Computer integration in the curriculum for children may add part of cultural and recreational activities that are interesting through programs like animation and graphics, and as a result may enhance the total development of the child and awareness of various illnesses like HIV/AIDS which is prevailing in Botswana.

The programs at early childhood institutions need to provide or include modern technology like the use of computers as per the Millennium Development Goals, since one of them emphasizes making available the benefits of the technologies especially

information and communications technologies. Again Vision 2016 (Republic of Botswana, 1999a) a pillar which reads as “an educated and informed nation” emphasizes that, all schools will have access to computers, and to computer-based communications such as the internet. The accessibility of computers and internet in schools should include preschools. The Government through the Ministry of Education and Skills Development plans to attach the pre-primary centres into all primary schools by the year 2008 (Bose, 2008).

1.3 Computers and preschool education in Botswana

The future of Botswana as expressed in the Vision 2016 demands that all members of the society must play a recognizable role in ensuring continued and improved education that is accessible to all. Improved education for the millennium is envisaged to include computer literacy without exception to early childhood education (Republic of Botswana, 2001a). There is evidence that there are computers in preschool classes in Botswana. This was proved by a study carried out by Bose (2005) which was about the computers in reception schools (preschools) in Gaborone. Bose investigated the availability and appropriateness of computer use, infusion of computers in the ECC&E curriculum and availability of trained infant teachers with computing skills. The findings of the study which involved six preschools revealed that most privately owned preschools have computers. This raises a concern regarding children from families that cannot afford to send their children to private preschools. This disparity implies that the children growing up without exposure to computers may fail to fully take advantage of computer use at an early age and thus creating some form of digital divide among children. Bose found out

that the computers were mainly used in the computer lab for Computer Literacy and for playing games. The preschools did not have access to internet. The results also showed that children were taught by qualified computer teachers yet not trained to teach preschool children. It is important to note that the study was carried out four years ago, and there is a need to review as to whether there has been any development, also to investigate the programs used to facilitate learning, and whether these programs are developmentally appropriate to children. In other words, do they cater for the cultural norms and values of Botswana? These questions are results of the findings that most preschool teachers are not trained in ECC&E programs in which most of them are expatriates in Botswana. This aspect is also related to the notion of indigenous knowledge's system as a critical attribute among societies as it enhances local cultural values and technology transfer.

The Ministry of Education policy document (Republic of Botswana, 1980) for Early Childhood Care and Education (ECC&E) provides no teaching-learning framework for children. At the moment, there is no formal curriculum in Botswana for preschools. The renewed policy also indicates that curriculum activities for early stimulation in preschools should be drawn from a framework designed by the preschool development committee (Republic of Botswana, 2001a). This has not yet taken place. The Department of Curriculum and Testing is responsible for designing the formal curriculum.

There has been a considerable increase in young children's use of computers in Botswana private preschools especially in Gaborone (the capital of Botswana). The preschool

curriculum is not available as yet which makes one wonder whether school integrate computers across the curriculum. A study conducted by Bose (2005) revealed that while few schools integrate computers in the curriculum, none of the schools had internet. This is an important finding which opens an avenue to position the present researcher's study. However, there are some areas which have not been addressed through research in Botswana such as the appropriateness of computer programs used in preschools as well as strategies adapted to infuse computers when teaching preschool children. In this study the researcher will address these areas by investigating the extent to which preschool educators in Botswana integrate computers in the learning of preschool children.

1.4 Statement of the problem

The integration of computers is advocated in the Revised National Policy on Education Republic of Botswana (1994b) which emphasizes the infusion of technology in the teaching and learning processes. The computer is one such technology. It is in this policy framework, that preschool teachers should fully infuse computers in the learning of preschool children. However, there are several problems that are being encountered in Botswana when trying to carry out such task in preschools. One such problem is the absence of the curriculum for preschools, as a result, this makes integration of computers difficult for teachers (Bose, 2008). Preschool teachers are also, not trained in ECC&E. It is noted that teaching strategies on how to infuse computer skills when teaching preschool children are not emphasized. Preschools do not have access to the Internet to be used when teaching young children. Preschool children are not introduced to computer games and programs which are developmentally appropriate for their age and culture

(Bose, 2005). Therefore, it is important to carry out the study in order to establish the extent to which computer are integrated across the curriculum by preschools in Botswana and how it can be improved, as well as if the programmes used by preschool teachers are developmentally appropriate to the learners or not.

1.5 Purpose of the study

The study explored the extent to which computers are being used in preschool learning. The study also attempts to establish the extent to which preschool educators in Botswana integrate computers in the learning of preschool children across the curriculum and if the computer programs in use were developmentally appropriate and culturally sensitive to the learners.

1.6 Research questions

The following research questions were pursued:

1. Are teachers using computers in the learning of preschool children?
2. What computer programs are used by preschool teachers?
3. Are the computer programs used developmentally appropriate for the preschool children of Botswana?
4. Are teachers integrating computers in the learning of preschool children?
5. How are the programs integrated in to the curriculum?

1.7 Significance of the study

This study comes at a time when preschool learning is at the centre of education discourse in Botswana. This is the time when the preschool curriculum is being developed hence the results of the study will help the curriculum developers during and more ahead.

The aim of this research is to investigate the usage, integration and developmentally appropriateness of computer programs in preschools. This may help to provide relevant information to the Ministry of Education and Skills Development. The study thus intends to recommend the inclusion of computer education and integration across the board for development of ECC&E curriculum in Botswana.

The outcomes of the study are expected to benefit preschool teachers to enthusiastically integrate computers in the curriculum when teaching. The study is expected to sensitize teachers on the use of programs that are developmentally appropriate and culturally sensitive to the Botswana context.

1.8 Limitations

Due to recurring power cuts in Botswana, the researcher was often interrupted and could not continue with research proceedings. This caused delay. In addition, during data collection period some appointments were unsuccessful and were postponed due to load shedding.

Written questionnaire was answered by school heads only, who also owned some of those preschools so the chances are that they answered in their favour.

The oral interviews administered could have caused nervousness to some teachers, and perhaps did not reveal the truth. Due to limited number of preschools which have computers, the researcher focused in ten preschools in the city of Gaborone only.

1.9 Delimitations

The researcher was self sponsored therefore, did not have funds to enable her to choose a larger sample size in the country whereas time was also a concern. However, the results of the study can be generalised given the newness of this innovation at preschool level.

1.10 Definition of terms

In this study, the following terms will be used as indicated;

Computer	An electronic machine used to find, sort, compute etc information in various ways. It is a technological tool.
Computer integration	Infusion of relevant computer programs in the learning of the children across the curriculum.
Preschool Curriculum	Group of subjects taught at a particular school. In preschools curriculum is commonly known as themes.
Director	School head, the one responsible for operation of the preschool.

Preschools

Schools for young children with the aim of preparing them for formal schools. Under the same setting there are varied services provided being; day care, nursery, bridging and reception.

Preschool children

Girls and boys in preschools, from age 4 to 6 years those that are prepared for formal school.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter presents a critical review of literature directly related to the study. The literature review will cover both international and local sources together with unpublished and published works from varied sources. Their findings were used in comparison to those that the researcher found. It seems very little work has been done on the extent of computer integration in the learning of preschoolers particularly in Botswana. Nevertheless, other scholar's findings, methods of investigation, strengths and weaknesses will be presented in order to address the research objectives.

This literature review is organized into subheadings which helped in answering the following questions; Are teachers using computers in the learning of preschool children? Are teachers integrating computers in the learning of preschool children? What computer programs are used by preschool teachers? Are the computer programs used developmentally appropriate for the preschool children of Botswana? How are the programs integrated in the curriculum? Some of the headings were also helpful in trying to answer research questions as follows:

- What is Government policy towards computer integration in preschool?
- To what extent are computers used and integrated at preschool in Botswana?
- What are the failures and successes of computer integration?
- Are there any weaknesses and strengths in the use of computers?

2.1 Use of computers in the preschool

The document on Communication and Study Skills (Republic of Botswana, 2001b) defines a computer as “a machine or device that can be instructed to accept raw data (input) and process it into some useful information (output)” (p.3). Computers are widely used in public places and at home, as such this makes it necessary for schools to include it in the learning process. A study on early computer learning for African American males attending two large urban elementary schools showed clearly that, teachers were the most influential persons in these African American male’s computer learning experiences. The study also found out that, pre-service instruction of teachers does not promote familiarity or instructional development with computer whereas in-service training programs for teachers in computer use are either scanty or nonexistent. Thus they needed training on how to incorporate computers into the classroom curriculum and objectives more effectively. The finding that learning about computers from family members was more common for the students than learning about computers from peers suggests that stronger partnership should be forged between teachers and the families in providing quality computer education (Carver, 1994).

Landerholm (1995) studied the early childhood teacher’s computer attitudes, knowledge and practices, where 250 kindergarten and preschool teachers in public and private schools were used as population. The results showed that most of the teachers had positive personal and professional attitudes towards using the computer. It is important to note that in as far back as 1995 there were teachers who showed positive personal and professional attitudes towards computer usage with elementary school children.

In recent years computer use with pre-school children has created debate among early childhood educators. Researchers have been wondering whether or not children are mature enough to use computers. When responding to the controversy surrounding computer use by pre-school children, Lynch and Warner (2004) investigated head teacher/director's reports on the use of computers in Texas child care facilities. Methods used to collect data were a questionnaire for the directors of the pre-schools. Results indicated that preschool children begin using computers in child care centers between ages 2 and 4 years, regardless of socioeconomic status. He also reported that the directors responded that the most important goal in children's use of computers was to extend concepts learned in the classroom. Therefore it can be said that computers can be used by preschool children for various purposes as much as elders and this is applicable to children of Botswana as well.

Another study carried out by Plowman and Stephen (2003) on ICT and pre-school children; reviewed the international research evidence on the ways in which ICT are used in formal and informal preschool settings. Some of the objectives of the study were to review the debate over the value and desirability of young children using computers, the literacy involved in using the media and the literacy design and interactivity. The findings revealed that, children are more likely to experience uninterrupted and extended periods of time at a computer when at home rather than at school. The resources they used focused on software for standard Personal Computers (PCs) rather than technologies such as computational toys that make it a difficult task for parents and educators to make judgment about choosing developmentally appropriate educational software. Also they revealed that children use computers more often than books or toys for diverse purposes

but mostly for play. The study found out that, children use computers at home. It may be true that preschool children enjoy manipulating computer more than reading books since manipulation is one of their developmental stages (Plowman and Stephen, 2003).

The summary of the studies reviewed within the section appears to build up to a case that since computers are used by children, its impact should be studied as well as whether the computers are widely used at home or at school in Botswana could be studied.

Computer should be viewed neither as good nor as bad but rather as a tool, similar to the many other educational resources used by children. Sheridan and Samuelsson (2007) studied learning through ICT in Swedish Early Childhood Education Countries like Sweden who are reported to be world leaders in terms of number of computers per capita and frequency of Internet use. They aimed at finding how teacher education and their competence affect children's capabilities to learn through ICT. They discovered that, in preschools of a high quality, a computer becomes yet another resource, while it is seldom used in low-quality educational setting. They emphasised that teacher's competence in guiding children's learning through ICT and their attitudes toward it determines pedagogical perspective of ICT quality in preschool.

If learning through ICT requires preschool teacher's special skills to direct children's attention towards both content and form then there is need for qualified ECC&E educators. One of studies conducted in Botswana (Bose, 2008) showed that most of the ECC&E centers did not have trained teachers. Hence it makes one wonder how they transform children's attention towards content and form in a situation where skill is paramount.

New and Cochran (2007) reported that computer and video games are becoming increasingly present in young children's lives in the United states, where 70 percent of children between the ages of four and six have used a computer. It is impressive to realise that in countries like United States large number of children have access to computers. However, the situation may not be the same for developing countries like Botswana.

The studies reviewed show that computer is vigorously used for various purposes in the learning of young children. The parents and teachers play a major role in providing and determining the use of computers by preschool children.

2.2 Computer use and integration in the learning of preschool children

One of the important aspects of this research is the proper use of computers by preschool children and how they can use them effectively with the help of teachers. According to Jackman (1997), if one offers a computer as learning center for children, they will accomplish many of the same objectives that they do in other areas. The emphasis is to encourage children to develop positive self-esteem while playing cooperatively with others. He also encourages teachers to place two computers side by side in order to accomplish socio-cultural skills. A computer if used like other resources as a tool in a classroom can create positive effects like developing children's social skills. It also brings unity, love and care among young ones since they will have to copy from others and help one another.

The use of a computer assisted instruction in preschool education is a study carried out by Vernadakis, Avgerinos, Tsitskari and Zachopoulou (2005) in Europe. They discussed research avenues employing computers as a learning tool and analyzed the results obtained by the stated method at the preschooler's learning level. The researchers also determined if the computer assisted instruction was a useful tool to enhance cognitive, emotional, linguistic, and literacy skills in pre-school children. Their findings reveal that there was some evidence that supported the positive influence of computer usage as a learning tool for children at preschool as compared to traditional ways of teaching. Students who used computer assisted instruction scored higher on achievement tests, develop positive attitude, increased attention span and had greater improvement in phonological composition with use of computer assisted instruction rather than traditional method.

The same study revealed that gender differences between boys and girls were evident in learning interest from the designs of computer assisted instruction. Boys preferred game activities while girls had more interest in the visual aspects of the game. Computer integration proves to be the best strategy for the higher results it produces, long attention span it creates. It helps one to deal better with preschool children, as it is always advisable to work with them directly to build rapport and reduce chances of gender disparities observed in this study. The study opens an avenue for future research which we can find out if computer assisted instructions substantiated gender differences.

However, the situation is not the same in Botswana being a developing country. The results in the study might reveal a different picture.

According to Facer, Furlong, Furlong, and Sutherland (2001), despite the low ratio of computers to students, and lack of quality software or that technology is too complex, schools put computers in a single room where children use them once a week under a teacher's supervision. Schools have effectively minimized the potential impact computers can have on children's learning by turning the technology into a separate, unrelated subject area called computer literacy. Their suggestion is that the term "integrated learning" has gained popularity over the past half-decade, evidenced by the appearance of numerous pre-packaged reading, math, and science curricula on the pages of educational software. Unfortunately, these well-marketed packets are often no more than unrelated activities clustered around a single topic and give little consideration to the development of larger concepts or goals.

Some benefits of ICT software were identified where cooperate plays, children helping each other to write their names and early attempts at spelling were noted. This is an indication of emergent literacy (Dale and School in Siraj-Blatchford I, & Siraj-Blatchford J, 2007). This implies that with appropriate software which support educational activities children can benefit from computers at an early stage.

New and Cochran (2007) contend that:

Constructionism might best be defined as a constructivist philosophy for educational technologies. Constructionism asserts that computers are powerful educational

technologies when used as tools for supporting the design, the construction and the programming of personally and epistemologically meaningful projects. (P. 149).

The belief is that computers should not be used to replace types of children's social, cognitive and physical outdoor activities but computers should be infused in learning activities as complements rather than substitute. When teachers show positive attitude towards computers use and integrate it in varied activities like including it in learning center in a classroom, children will respond positively to the tool. Essa (1999) concluded that centers offer spaces that provide the just right challenge for each child to be more independent in their learning, that is to say teachers should be nurturing and responsive in order for young children to learn that they are capable so that they develop positive attitude.

The various research studies reviewed suggest that some educators should be careful when integrating computers in the learning of the young children. This can be achieved through vigilant selection of appropriate software which emphasizes child learning and development.

2.3 Programs used by teachers and nature of computer integration in the curriculum.

If the computer programs used by the teachers are not developmentally appropriate to the learners, learning through computer may not be effective. Use of computer programs which are developmentally appropriate includes programs which are relevant to children's age, capability and cultural norms.

2.3.1 Age appropriate computer programs

Teachers should offer children developmentally appropriate explorations of concepts through hands-on activities with concrete materials, then offer computer experiences that build on these explorations (Essa, 1999). Not all computer programs are developmentally appropriate, since some program developers do not have knowledge and skills for fostering child development. The children's response to computers will be within their developmental range.

The selection of computers and computer software for an early childhood program must follow the same principles as the selection of any developmentally appropriate materials. The National Association for Education of Young Children (NAEYC) technology and young children-ages 3-8, can guide teachers in what may seem to be a complex and difficult task in evaluation of available resources (Dodge & Colker, 1998). The statement affirms the important role of a teacher as the one whose professional judgment ultimately deems developmental appropriateness of technological learning materials. This proves beyond reasonable doubt that there is a way to choose these preschool children's programs.

The natural way to extend children's learning in the computer area is to gradually introduce them to new software that will challenge them in different and exciting ways. By so doing, variety and interest are added to increase challenges for the children. The children's favourite software should always be available to them, since their curriculum suggests that children learn from what they know to what they do not know. Mirroring

offers opportunities to extend children's learning. For example, children can use a computer program that mirrors attribute blocks to put blocks together into new shapes and designs. Familiar concepts are thus explored in new and exciting ways (Dodge & Colker, 1998).

This is further stressed by Siraj-Blatchford, I. and Siraj-Blatchford, J. (2007) who also came up with some important observations to note when choosing computer programs to be used by preschool children. The Developmentally Appropriate Technology for Early Childhood (DATEC) research found that the best application:

- a). Were educational
- b). Encouraged collaboration
- c). Supported integration
- d). Supported play
- e). left the child in control
- f). Were transparent and intuitive
- g). Avoided violence or stereotyping
- h). Supported the involvement of parents.

Looking at the above guide strategies for choosing preschool programs one can conclude that when parents, teachers and children collaborate towards the same goal it may lead to improved academic performance as advocated by Carver (1994).

2.3.2 Individually appropriate programs

It is necessary for teachers to be in a position to choose programs that are appropriate to the individual child development. Programs such as, building blocks for early childhood mathematics is a study carried out by Sara and Clement (2004) by using a design and developing model that drew from theory and research. The assumption that curriculum and software design should have an explicit theoretical and empirical foundation beyond its genesis in someone's intuitive grasp of children's learning formed a base for the design process. It should interact with the ongoing development of theory and research reaching towards the ideal of testing a theory by testing the software and the curriculum in which it is embedded.

Their model includes specification of mathematical ideas (computer objects or manipulation) and process (software actions) and extensive field testing from first inception through to large summative evaluation studies. The results showed the approach can result in significant assessed learning gains consistent with the Principles and Standards for School Mathematics of the National Council of Teachers of Mathematics. Therefore if preschool teachers take advantage of such program they will be in a position to help in the development of an individual child.

Various researchers are busy looking into different aspects of computer literacy depending on the identified problem at the time. Morgado L, Morgado M and Cruz (2007) investigated embedding computer activities into the context of preschools. They provided samples that serve as examples of how powerful environment such as computer-

programming can be embedded in the overall context of the non-computer activities. With help of appropriate programs teachers can cut pieces of each animal and use the pieces among the original picture to develop the matching game. A computer can be used as a source where activities planned were off the computer for instance children using the computer to check teacher's records or decorate a house and internet to communicate by e-mail. ToonTalk as a program can be created entirely while playing in an interactive, animated cartoon story. Children aged 3, 4 and 5 have made such ToonTalk programs and this setting place a situation where there is a positive motivation for their development (Morgado et al., 2007).

Of course, teachers do not need to limit themselves to programs specifically designed for a particular purpose. If they are familiar with software, they will be able to tell which programs would make good activities for computer integration in relation to themes or curriculum.

2.3.3 Multicultural teaching using computers

Multicultural education relates to education and instruction designed for the cultures of several different races in an educational system. This approach to teaching and learning is based upon consensus building respect, and fostering cultural pluralism within multi-racial and multi-ethnic societies. Multicultural education acknowledges and incorporates positive racial idiosyncrasies into classroom atmospheres (Wilson, 2008).

A multicultural curriculum should be considered for several reasons, it should;

- a) Provide alternative points of view relative to information already taught in most educational systems.
- b) Provide ethnic minorities with a sense of being inclusive in history and science.
- c) Decreases stereotypes, prejudice, narrow-mindedness, and racism in the world.

Educational institutions have been dictated too long by attitudes, values, beliefs, and value systems of one race and a class of people. The future of our universe is demanding a positive change for all (Hilliard & Pine, 1990). This is important because each and every country has more than one tribe and/or ethnic groups that exercise different cultures.

Since a child is unique with an individual temperament, learning style, family background, and timing of growth, need for different types of stimulation and interaction to exercise their developing skills and to build up new ones is very important. It is important to note that the skills mentioned should not be taken as universal, particularly in terms of their appearance in children's action. However, the skills need to be modified to reflect cultural considerations and the opportunities available to children to develop the skills, knowledge and abilities generally associated with a given age (Evans, Myers, & Ilfeld, 2000). Children in preschools are faced with different cultures since the home provides background of one's culture and the school provides new and varied cultures. In the preschools, children are taught by educators with different backgrounds from the child and they play with peers from different cultural backgrounds. That serves as a base

to see to it whether teachers cater for individual children when integrating computers in the curriculum or every child is provided with the available program.

Tiedt, P. and Tiedt, T. (2005) say computers have much to offer to multicultural teaching. Word processing and CD-ROM programs provide children with multicultural applications such as encouraging children to write, read and solve problems as they meet challenges of the trail. Internet educational sites like developing empathy for others, exploring the world, web smarts for teachers and students add content and interest to multicultural teaching and learning.

Moreover the recommendation by NAEYC (2008) that children's knowledge of the social and cultural contexts in which a child's life is a crucial one and computer programs should be designed in line with one's culture. That is why computer integration is paramount so that children's learning is fostered, it is with this tool that children can learn moral values of their people, parents can share knowledge and perhaps reduce the use of 'don't do this', 'do that'. In his article on education matters Tabulawa in the Gazette news paper (2007) indicated that the technocratic curriculum has serious implications on most Batswana. He continues to say that most Batswana lack societal grounding where by children are often blamed for being delinquents. He argues that children should not be blamed since they are victims, rather schools and families should work together in designing a curriculum that will enhance social and cultural milieu. Integration of computers in the learning of children, which includes culture of their society, may in one way or the other limit such observations. This is why it is of great need for computers to be introduced to children at an early age.

The question now focuses on whether or not the teachers are fully aware and well trained in computer integration or the budget can support the decision and how to acquire developmentally appropriate computer programs for young children. It is of paramount importance for government to take an active part in funding preschools as this will allow the relevant government stakeholders to encourage interventions such as computer integration in a way promoting one's own culture.

2.4 Government policy and computer integration

The ECC&E policy document (Republic of Botswana, 2001a) is the one that governs the operation of preschools in Botswana. ECC&E programs represent an important area for government intervention since they have the advantages to fight against poverty and formal school readiness. Participating children are provided with critical extra support and attention, which improves their school readiness and gives them a better chance of breaking the cycle of poverty (Bernett, 2007). Therefore if government intends to infuse developmentally appropriate computer programs in the curriculum then it would be beneficial to young children.

Republic of Botswana, (1999b) indicates that every mathematics teacher should have access to a computer with appropriate software and network connections for instructional and non-instructional tasks. Used to its full potential, the computer can become an integral part of the curriculum at all grade levels and for all children (Glass in Garegae, 2003). Computer integration should be done across the curriculum for all the subjects not for mathematics only.

The future of Botswana as foreseen by the Vision 2016 demands that all members of the society and parents must play a recognizable role in insuring continued and improved education that is accessible to all (Republic of Botswana, 1999a). The improved education that is desired for the millennium should include computer literacy and as such this does not exclude the early childhood education (Republic of Botswana, 2003). Furthermore Vision 2016 envisaged that Botswana will be an educated and informed nation (Republic of Botswana, 1999a). To this end, the Ministry of Education and other ministries involved continue to strive for provision of quality education and training that is accessible to learners of all age groups. The implication of the vision statement is that everyone should be provided with quality education despite their age. Therefore preschool children are also entitled to quality education in order to attain their potential and contribute to the national socio-economic and technical advancement. This can be fully achieved through the use of computers in preschools as Bose and Tsayang (2005) indicate that ICT plays an important role in the advancement of competitiveness in the global technological era.

Some political parties take early childhood education seriously and promise to strengthen early years of education by providing every child the best start in life. They promise to do so through provision of high quality and free nursery education through their mother tongue, as well as to train preschool teachers (Botswana Congress Party, 2004). It is quite possible that they might think of computer integration in the preschools as well.

2.5 The extent of computer use and integration in Botswana preschools

The use of ICT in the early years has the potential to enhance educational opportunities for young children. Appropriate ICT can encourage purposeful and exploratory play. Among other things it can encourage discussion, creativity, problem solving, risk-taking and flexible thinking. This can all be achieved in a play center and responsive environment. However, it does demand that early years educators are well trained and skilled in the appropriate uses of ICT with young children. Staff should therefore seek help and support to develop their skills, as well as their use of appropriate literature and research.

Little research has been done locally regarding computer use and integration especially in preschools. Botswana like many developing countries is one of those that included the use of computers in education as per policy document (Republic of Botswana, 1999a). Some schools also provided computers for learning of the children. In a study “computers in reception schools- a case of Gaborone, Botswana” it was found that most privately owned preschools in Botswana have computers (Bose, 2005). Due to high demand of computer usage, some technicians found it necessary to provide programs for integrating computers in the learning of young children. Such programs are either available in the CD-ROM or in the Internet. These programs are developed in English as well as Setswana and makes learning easier, fun and interesting for the children. Contents of the product are games and quizzes, voices, sound, animation, video and audio clips of children talking openly and honestly about certain important issues like HIV/AIDS (Singh, 2004).

2.6 Strengths and failures of computer integration

Strengths and failures of computer integration may be due to the fact that computers are new innovations in countries like Botswana. For instance in order to implement an innovation like computer integration there has to be funds for any new innovation, well trained human resources and facilities to be used. The study that explored the role of federal funding in computer education by Birman and Ginsburg (2007) explored the needs associated with computers in the schools, and what role should the federal government have in meeting those needs? The results show that other bills would provide funds to train teachers to use computers, cancel federal loans to students who become teachers of computer technology (as well as teachers of math or science), and fund reviews of software. If ECC&E providers in Botswana could consult with government to provide enough funds in order to cater for purchasing of computers and computer programs then computer integration will be achievable. The funds could also be used for provision of Internet services and staff training.

The role of computers in the early childhood curriculum should be that of uniquely adding to children's experiences. Computers are not a substitute for running, jumping, playing with blocks, digging in the sand, and enjoying storybooks all of which help foster intellectual development. However, if the right software is used the computer can be an excellent supplement to these traditional activities (Roschelle, Pea, Hoadley, Gordin & Means, 2000). In their study 'Changing how and what children learn in school with computer-based technologies', they discovered that computer technology can help support learning that is useful in developing the higher order skills of critical thinking,

analysis and scientific inquiry. The presence of computer applications has been shown to be successful, but how well even the most promising applications are implemented depends more on the teacher and/or the program integrated. Adequate supervision by parents and teachers should be administered at all times during computer usage by preschool children to avoid indulging in some computer programs which may lead children to antisocial behaviours such as pornography and gambling.

2.7 Summary

Computer skills are very pivotal in most organisational duties such as locating books in the library and writing reports. Education too is fast moving towards greater use of the computer as whole schools are electrified, teachers learn how to utilize computers in the classrooms and in laboratories (Tiedt P & Tiedt T, 2005). Preschool children shall, never be left out of this setting as future leaders.

The aim of a preschool is to engage children better with the world and to help them develop personal and social skills. Computer integration has proved to enhance children's social and cognitive skills and holds promise for student's achievement and teacher quality when appropriate and educational programs in the preschools are used. As such some private preschools do manage to provide children with computers. Thus the question is what programs are they using to integrate computers in children's learning?

The number and variety of educational computer programs (software) and the availability of Internet provide teachers opportunity to integrate computer as much as possible in the

teaching/learning of preschool children. But given the range of computer hardware and software that is now available on the educational market, it becomes difficult for early childhood educators and parents to make informed choices when selecting developmentally appropriate programs. There is a need to provide early educators with guidance that assists in identifying the most appropriate applications of ICT. DATEC's publication of exemplars and guidance material for parents and early childhood educators will perhaps provide such help.

The Government of Botswana provides grants to community based settings in that way helping them to meet some recommended standard. The Ministry of Local Government is responsible for setting the operational standards and monitoring of preschools. Such standards do not include curriculum development. In that case, whether to integrate computers or not becomes the preschools decision. Since some privately owned preschools had shown to integrate computers in children's learning, these preschools choose the computer programs to be used by children.

The writer feels that it is time for preschools to get proper recognition and be given appropriate treatment by government. All Botswana children should get modern education, they should be thoroughly prepared for 2016 as advocated by Botswana Vision (Republic of Botswana, 1999a). The issue of no curriculum in preschools leads to differences in the operations of preschools.

CHAPTER 3: METHODOLOGY

3.0 Introduction

After critically reviewing the literature on computer use and integration in preschools, this chapter presents the methods used to collect data. The chapter also presents the design, method, sampling, verification, validation, ethical consideration, and data analysis of the study.

3.1 Research design

This is a survey study that employed both the qualitative and quantitative methodologies. According to Wiersma (2000) a research design is a plan or strategy of an investigation for conducting research. It provides answers to research questions and control variance. The research design guides the manner in which the study is to be conducted and creates a framework for the research.

3.2 The quantitative paradigm and methods

The researcher visited the preschools and talked to the teachers. The questionnaire was administered to the school heads. These data were used to reflect whether or not there was computer integration and to examine appropriateness of programs used by preschool teachers. Moterm (1998) has this to say; *"the quantitative methods are formal, objective, systematic processes in which numerical data are utilized to obtain information about the world"* (p. 140). In this case, the development of instruments and methods of measure in form of questionnaires helped the researcher to collect empirical data. The data collected were evaluated and use of numerical data assisted in generalizing the results.

3.3 The qualitative paradigm and methods

The researcher chose qualitative methods as well because they are subjective. Qualitative research has origins in descriptive analysis (Yin, 2002). The researcher described the extent to which teachers integrate computers in the learning of children as well as state the program's relevance to developmental stages of children. The observation focused on explicit behaviour, which only describes what happens during sessions (Descombe, 1998). Since qualitative research is inductive in nature, it looks at a specific situation to understand social phenomena and it does not necessarily base on general principles (Biklen, 1992). These qualities are most suitable to this study because the researcher used teachers' words from the interview and described what was observed in those words and made some conclusion about whether computer integration was evident and appropriate to the learner's maturity. In order to achieve that, interview guide and lesson observations guide for teachers were designed to help obtain information from preschool teachers. Observations were made during computer teaching in the computer laboratory. Notes made during observations were used for codification. The researcher was involved in the research process and therefore the possibility of getting facts was high.

3.4 The researcher's role

This section presents the activities that the researcher undertook in this study. The researcher's role in this study was that of an observer. Head teachers and teachers were oriented (for one day) on the intended study. During lesson observations, the researcher interacted with teachers and made friends with them so that they become free in

exploring computer programs available. The researcher interviewed teachers in order to gain more data.

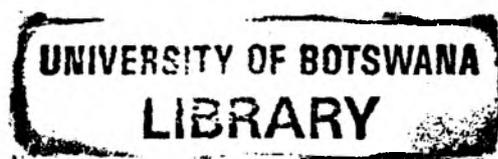
3.5 Study Population and Sample

Table 3.1 Preschools contacted

Name of administrative district		Preschool Type						Total
		Private	NGO	CBO	Church	Institution	Council	
Babusi Operational Area	Computers available	-	1	1	-	1	1	4
	No computers	13	2	2	2	-	-	19
Total		13	3	3	2	1	1	23
Gaborone North	Computers available	2	-	-	1	-	-	3
	No computers	12	2	-	1	-	-	15
Total		14	2	-	2	-	-	18
Gaborone West	Computers available	3	-	-	-	-	-	3
	No computers	16	-	-	2	-	-	18
Total		19	-	-	2	-	-	21
Grand total		46	5	3	6	1	1	62

This study is about computer usage and integration in preschool learning. Gaborone City Council divided its area in to three administrative districts namely Babusi Operational Area, Gaborone North and Gaborone West. According to Table 3.1, a total of 23 preschools were contacted in Babusi area. Among these, 19 did not have computers (13 private, 2 NGO, 2 CBO, and 2 church based centers) and 4 had computers (Institutional 1, council 1, CBO 1, and NGO 1. In another area (Gaborone North) there were 18 preschools altogether of which 15 did not have computers (12 private, 2 NGOs and

1 church based). There were 3 preschools which had computers (2 private and 1 church based). Gaborone West administrative area had 21 preschools altogether, 18 had computer (16 private and 2 church based preschools). There were 3 preschools which had computers that were all privately operated. In total, 62 preschools were contacted. Out of these, 46 were privately operated, 5 were operated by NGOs, 3 were operated by CBOs, 6 preschools were operated by church, council and institution operated 1 each. The study used the 10 preschools that had computers.



The purposive sampling technique was employed to select sample for investigation. Purposive sampling means that the units, in this case, the ten schools were selected because of their characteristics relative to the phenomenon under study rather than being selected randomly (Wiersma, 2000). Ten school heads were selected, in addition ten teachers were also selected in those ten schools. Then out of 10 teachers seven were preschool teachers, and other three were computer teachers. The seven preschool teachers were from preschools that owned computers hence were in a position to provide relevant information.

Meanwhile in three preschools children were provided with computer lessons as a separate subject. Therefore a computer teacher was hired specifically for teaching preschool children computers by a private company which outsourced the computer lessons to preschools. So the researcher had to select three computer teachers from those preschools that outsource computer lessons rather than preschool teachers who did not have any access to computers.

3.6 Instrumentation

The researcher used three instruments for data collection. The instruments were guided by the research questions. A QUESTIONNAIRE FOR PRESCHOOL HEAD TEACHER contained both closed and open-ended questions (Appendix A). Section A of the questionnaire included demographic data namely gender, qualification, teaching experience, type of preschool and age. Section B contained closed-ended items in statement form to measure the degree of agreement and disagreement for each statement. A Likert scale as follows: 1. Strongly agree, 2. Agree, 3. Do not know, 4. Disagree and 5. Strongly disagree was used. Respondents were to tick only one. The last Section, C, included structured items that intended to find out views of respondents by giving them the chance to express their views anonymously.

The other instrument used was an INTERVIEW GUIDE FOR PRESCHOOL TEACHERS (Appendix B). The first section (A) included demographic information. The second section (B), focused on the number of computers, number of children, position of the computers, and the reasons for such arrangements displayed in the class. The last section C was on the programs rendered, how they integrate them and the results observed.

The third instrument was LESSON OBSERVATION GUIDE FOR PRESCHOOL TEACHERS (Appendix C), which looked at the ratio of computer per child, supervision during computer lesson, integration of computers in to the curriculum and relevance of computer integration to the culture of Batswana.

3.7 Administration of the instruments

Head teachers were given the questionnaire to fill during their own time. The questionnaire was collected after two weeks. The preschool computer teachers were interviewed first followed by lesson observation which lasted for one hour. This was for triangulation purposes as it reduces the bias resulting from one method as well as includes data, which could not be efficiently collected through any one of the two methods (Chilisa & Preece, 2004). Throughout the lesson observation, notes were written.

The interview guide was used during interview for teachers. Descombe (1998) indicates that in interviews, the researcher's role is to be as unobtrusive as possible. The researcher started by introducing the topic and the theme of the research and let the interviewees give their views, with regard to questions on the guide. The respondents were given the freedom to share their experiences in integrating computers in the learning of children. To minimize dishonesty and bias in information provided, the researcher made efforts to be polite, punctual, as well as to be receptive. During interviews, the respondents were allowed to decide on the place and time of the interview and were allowed to ask questions. The researcher had to probe interviewees for clarification and confirmation of responses. A notebook was used during the interview session for writing what teachers said. The interviews were short (15 to 30 minutes) in order to avoid the respondents losing interest.

Lesson observations were also used and were helpful in order to find out more about computer integration and to compare with interviewee responses. Lesson observations are more direct and they draw direct evidence of the eyewitness events first hand. On the basis of this, the researcher chose to use them. Gay and Airasian (2003) say in participatory observation besides its effectiveness in minimizing bias arising from the emotions or personal background of the observer is also a flexible method. The researcher visited each school for two days in a week for lesson observation. During lesson observations, school time table, teacher's lesson plans, computer lab setting (the size of chairs and tables used), programs in the computers, interaction of pupils and the teacher towards computer as well as memos were observed and notes were written.

3.8 Verification

The credibility of the data is a very important element in any research study (Guba & Lincoln, 1999). It refers to confidence in the truth of the data. According to Guba and Lincoln (1999) there are several approaches that can be used to ensure that data generated by the research is credible, these include prolonged engagement in the field, persistent observations, peer debriefing and case analysis. In this study the researcher involved five colleagues and two lecturers to review and approve the tools to achieve the content validity and instruments credibility.

3.9 Ethical considerations

It is important to consider the rights and feelings of the subjects in order to avoid any deception or misinterpretation in the dealings with the research subjects. Letters of introduction explaining the study were sent to the department of local government particularly council, who are responsible for the ECC&E programs and head teachers, seeking permission to use the preschools head teachers, teachers and children as subjects (Appendix D and E). The researcher made phone calls to the preschool directors as a follow up to request appointments and explained the study further. Head teachers and teachers were informed about their role in the intended study and were promised not to use their names. Participant's names were not required and were not used in data discussion to ensure anonymity. To guarantee the confidentiality of the information given, codes were used instead of participant's names. The participants were informed that the use of results was only for the purpose of research and not anything else.

3.10 Data Analysis

The data collected was analyzed using both quantitative and qualitative techniques. In this study quantitative data collected were analyzed with the help of Statistical Package for Social Sciences (SPSS) where tables, bar graphs and pie charts were used to present the data. Percentages were used to compare and interpret the level of agreement and disagreement of school heads responses towards the use and integration of computers.

On the other hand the qualitative paradigm, advocates for the results not permitting statistical generalizations (Sedlak & Stanley, 2005). In the case of qualitative data, responses to the questionnaire, interview notes and observed information were sorted by emerging themes. Consistency between the different research instruments was established through comparison and contrasting of the emerging themes. The emerging results were discussed in relation to the literature review.

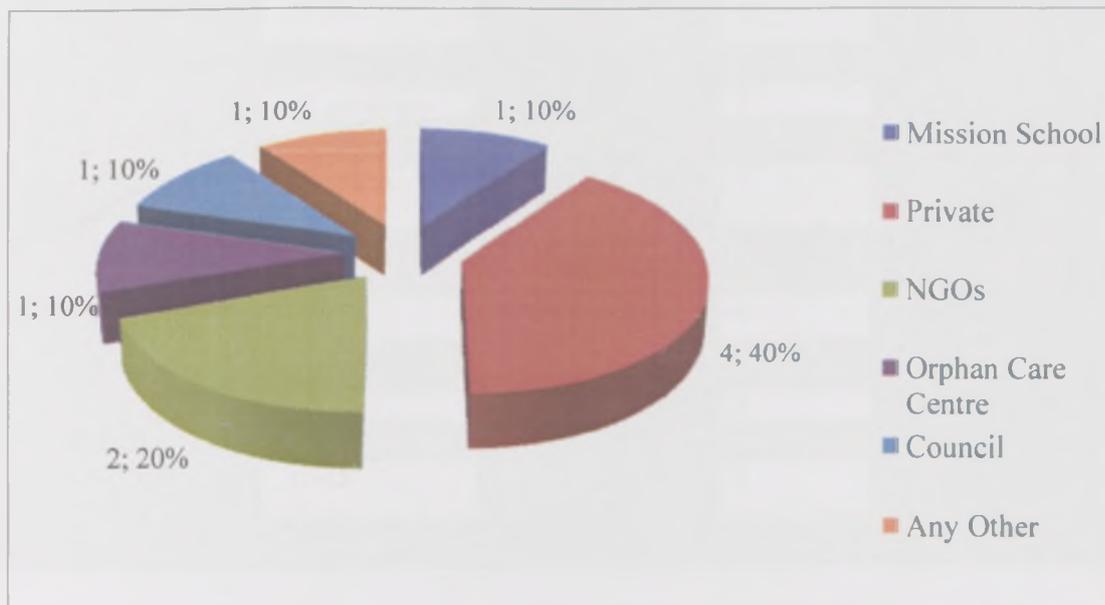
CHAPTER 4: PRESENTATION AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter presents the results and discussions of the findings. The first section focuses on the type of preschools that participated, followed by the presentation of demographic data of respondents. The second section presents the findings from the closed-ended questions in which the preschool heads responded to the Likert scale by indicating the level of their agreement, whether they strongly agreed, agreed, did not know, disagreed and strongly disagreed. The notes taken during teachers' interview and lesson observations were also presented, and then the discussions were made in relation to literature review.

4.1 SECTION I

Figure 4.1: Preschool Types



Ten preschools that participated were grouped according to type and the results are as per Figure 4.1 above. Only 1 preschool (10%) was a mission preschool, 4 preschool (40%) were private schools, 2 preschool (20%) were NGOs, 1 preschool (10%) an Orphan Centre, 1 (10%) a Council preschool, and 1 (10%) an institutional preschool (University of Botswana).

4.2 Demographic characteristics of Respondents

Table 4.2: Respondents demographic information

		NUMBER OF TEACHERS		PERCENTAGE
		Male	Female	
GENDER		1		5%
			19	95%
AGES	21-25	1		5%
	26-30		6	30%
	31-35		11	55%
	36-40		1	5%
	40 and above		1	5%
QUALIFICATION	Untrained		1	5%
	Certificate	1	7	40%
	Diploma		3	15%
	Degree		6	30%
	Masters		2	10%
PROFESSIONAL EXPERIENCE (Years)	1-5		9	50%
	6-10		2	10%
	11-15		4	20%
	16 and above		4	20%

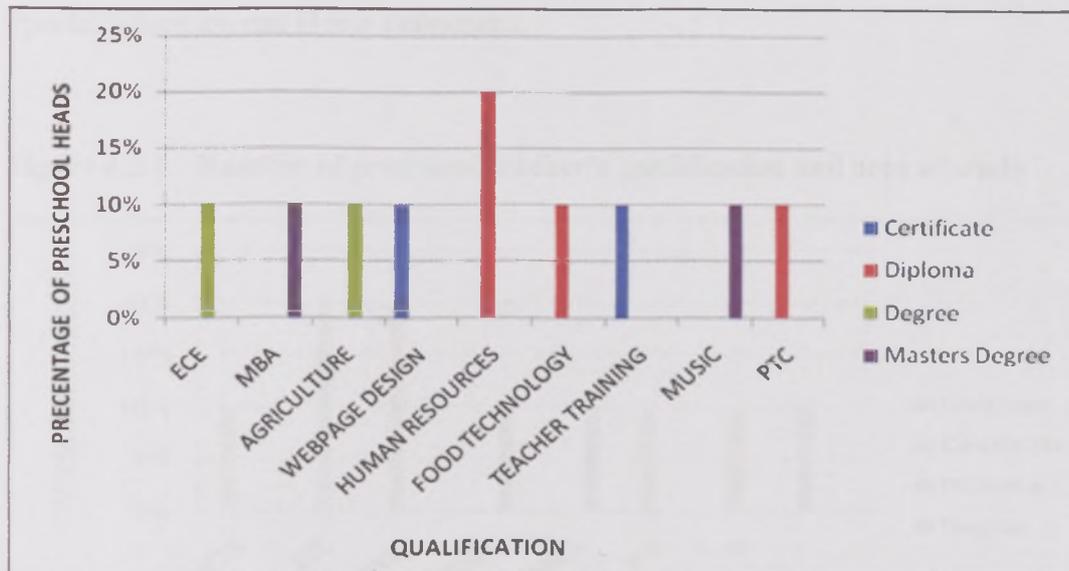
Twenty respondents participated in this study. Ten were preschool heads. The other ten comprised of preschool teachers (7) and computer teachers (3). The respondents were to state their gender, age, qualification and state their professional experience. Table 4.2 below shows the demographic information of preschool heads, preschool teachers and computer teachers. The table above (table 4.2) shows that the majority (95%) of participants were female teachers while only one (5%) was a male

According to table 4.2 above only 5% of the respondents were male aged between 21 and 25. The remaining were female teachers aged between 26 and 30 years made thirty percent of the respondents. Fifty-five percent (55%) of the respondents were aged 31 to 35. Only one (5%) respondent was of age range 36 to 40, while the remaining 1 (5%) respondent was aged above 40 years.

When addressing qualification aspect, the respondents were given the following options; untrained, certificate, diploma, degree and masters degree where they were to write their specific qualifications. The results show that, one (5%) of the respondent was an untrained female. Eight (40%) respondents one of whom is a male are certificate holders. Three (3) that is, (15%) of the respondents were females diploma holders and six (6) that is, (30%) had Bachelor's Degrees. The remaining two (10%) had masters degree (Table 4.2).

Data on school head qualification were presented separately focusing on area of specialisation as shown in figure 4.2 below. These were all females.

Figure 4.2 Number of preschool head's qualification and area of study



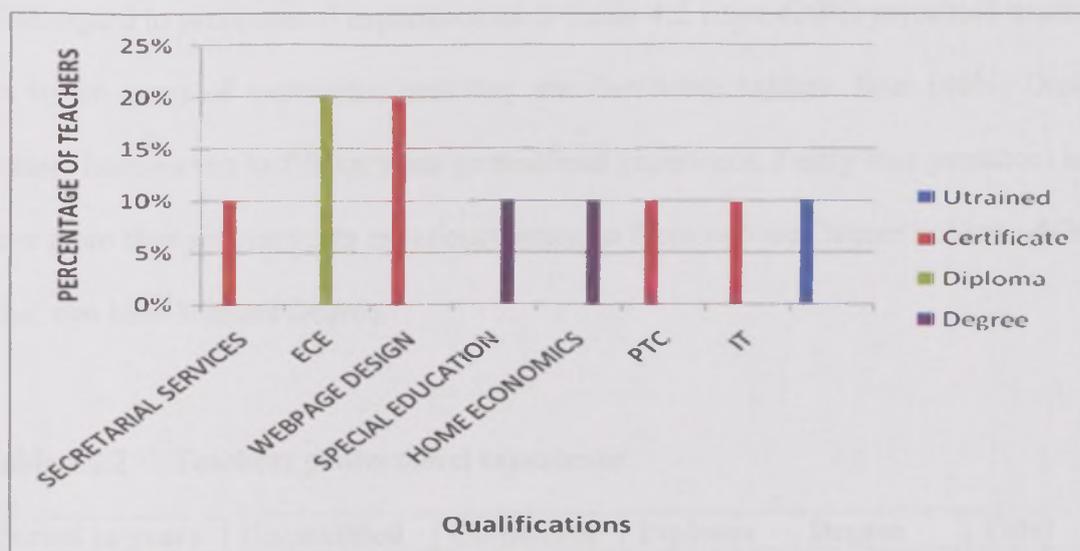
According to Figure 4.2 two preschool heads had certificate in Webpage Design and Teacher Training. Four school heads had diplomas in; Human Resource Management (2), Food Technology (1) and Primary Education (1). Of the two degree holders, one was in Early Childhood Education and the other in Agriculture. The last two preschool heads held masters degree in Educational Management and Music Education respectively.

Preschool teachers were also given the opportunity to further elaborate on their area of study with regard to their qualification. Their responses are shown in the Figure 4.2.1 below.

Figure (4.2.1) below shows that out of seven (70%) preschool teachers, three had certificate but specialised in different areas provided as: secretarial services, special education and Primary Teaching Certificate. Two preschool teachers held a diploma in

Early Childhood Education. There were two degree holders and each specialised in Special Education and Home Economics.

Figure 4.2.1 Number of preschool teacher's qualification and area of study



In the ten preschools that participated in this study, seven owned computers. The remaining three teachers were from preschools that did not own computers but outsourced it from private companies. One computer teacher was untrained, whereas others had different qualification. One of the computer teachers had a certificate in Information Technology while another one had a certificate in Web Page Design. According to the above Figure 4.2.1 it is clear that a small number (20%) of teachers were trained in ECE while majority were trained in different fields not related to ECE.

The participants were also asked about their experiences in ECE field, and their responses are shown in the below table (Table 4.2.1).

Table 4.2.1 Head teachers' professional experience

Period in years	Certificate	Diploma	Degree	Masters Degree	Total
6 -10	2 (20%)				2 (20%)
11 -15		4 (40%)			4 (40%)
16 +			2 (20%)	2 (20%)	4 (40%)
Total	2 (20%)	4 (40%)	2 (20%)	2 (20%)	10 (100%)

With regard to professional experience as in Table 4.2.1 two (20%) preschool heads had six to ten years of experience and they are Certificate holders. Four (40%) Diploma holders have eleven to fifteen years professional experience. Lastly four preschool heads have more than sixteen years experience amongst them two are Degree holders while the other two have Masters Degree.

Table 4.2.2 Teachers professional experience

Period in years	Unqualified	Certificate	Diploma	Degree	Total
1- 5	1 (10%)	5 (50%)	2(20%)	2(20%)	10 (100%)
Total	1 (10%)	5 (50%)	2 (20%)	2 (20%)	10 (100%)

According to Table 4.4.2, all the preschool teachers had the least experience (1-5 years). One was untrained, five (50%) held certificates and two preschool teachers were diploma holders. Two (20%) had experience of 1 to 5 years and each held a degree.

4.3 SECTION II

4.3.1 The use of computers in the learning of preschool children.

Table 4.3.1.1 below shows the responses to the first research question which was intended to find out if preschool heads use computers in the learning of preschool children. The school heads were sure of what they had to respond to and did not tick 'I

do not know' portion that is why it is not included in the tables. Also, the interpretation purposes for the positive ratings '**strongly agree**' and '**agree**' were grouped to mean the positive while the negative ratings '**strongly disagree**' and '**disagree**' were grouped to mean the negative.

4.3.1.1 School heads' responses on use of computers

Table 4.3.1.1: School heads' responses on use of computers

Item	SA	A	D	SD
My centre has enough computers.	2 (20%)	3(30%)	5(50%)	0(0%)
The ratio of number of computer/ child is proportional.	1(10%)	5(50%)	2(20%)	2(20%)
Computers are used every day by children.	1(10%)	2(20%)	5(50%)	2(20%)
Teachers in my preschool are well equipped with computer skills.	7(70%)	0(0%)	2(20%)	1(10%)

According to Table 4.3.1.1 above 50% of school heads said that their centres had enough computers and the remaining 50% of the respondents disagreed with the statement. Sixty percent (60%) of the respondents stated that ratio of computer per child was appropriate. On the other hand, forty percent (40%) of the respondents disagreed with the statement that the number of computer per children was proportional. Seventy percent (70%) of the school heads disagreed with the statement that says computers are used everyday whilst the remaining thirty percent (30%) agreed with the statement. Further, seventy percent (70%) indicated that teachers in their schools were well equipped with computer skills while the remaining thirty percent (30%) heads disagreed with the statement that their teachers were well equipped with computer skills.

4.3.2 Teachers responses on use of computers

Teachers were interviewed about computer use in their preschools. The interview report shows that out of ten teachers interviewed, the number of computers in preschools varied from one preschool to the other. The information in Table 4.3.2 below shows the number of computers per preschool. Children used the computers in pairs as well as in groups therefore the table also indicates the number of children using it at a given period.

Table 4.3.2 Number of computers in the preschools and number of children using a computer

Number of computers per school	Number of Preschool	Number of children per computer
1	4 (40%)	3-4
2	1 (10%)	4-5
3	2 (20%)	2
4	1 (10%)	4-6
5	2 (20%)	4-7

During the interview, in order to establish whether teachers use computers in the learning of preschool children, teachers had to state the number of the computers used by children in their respective preschools and the number of children using them. The results showed that different schools had varied numbers of computers. According to the teachers four preschools had one computer each where the computer was used by three to four children at a time. In one preschool there were two computers, and children worked in groups of four to five per computer. Two preschools had three computers each in which children worked in pairs, one preschool had four computers and two preschools had five

computers, in each of these preschools children worked in groups of fours to six children per computer.

Teachers were asked to state where the computers are located and the time taken by each preschool child on the computer. Four preschool teachers said that the computers are placed in the head teachers' offices. The preschool children go there for computer lessons three times a week. When one teacher gave reasons for keeping the computer in the office she said:

"It is the only computer we have in our school. This is used for both administration purposes and as learning tool for children. It is also kept in the head teachers' office for security reasons".

Another teacher said,

"It is mounted in the office for easier access of the Internet since the telephone line is connected in the office".

In two (2) schools teachers said that "computers are mounted in the computer lab". In one (1) school the computers were located in the preschoolers' classroom and the teacher said "the children are free to use computers as free play during their spare time". In the remaining three (3) preschools, computer teachers brought the computers with them and use a spare classroom for computer lesson. Teachers reported about the time spent by each child at the computer, two teachers reported that children spent 5 minutes using the computer, three said 10 minutes, while four teachers said 20-30 minutes. Some teachers said children spend 20-30 minutes in the computer depending on the activity they are

doing. There is only one preschool where the rest of the (class) children spent 45 minutes with the computer. The number of children per computer was not influenced by the size of the classroom it was influenced by the time the teacher had for all the children who attend computer lessons.

The question 'do children work independently on computers or you provide intensive monitoring?' also established the use of computers by preschool teachers. The majority (60%) of the teachers said they provide intensive monitoring except towards the end of term when children master the use of computer. Nevertheless another teacher in one preschool with enough computers used by children stated that:

"Children work independently since they listen to the instruction and click the mouse. I monitor children turns so that others can have the chance to work on the computer".

Another teacher said:

"I monitor intensively only in helping the children to control the mouse when they fail. The ones that are already good in using the mouse work on their own. In programs such as weather I intervene a lot since the children need clarification".

When asked to state their roles during computer lessons the teachers said:

Teacher A: *"I introduce the computer to the children. I teach them the parts of the computer like the monitor, screen, keyboard, mouse and mouse pad".*

Teacher B: *"I tell them to switch on the computer by themselves".*

Teacher C: *"I organize class activities, programs and monitor children's use of computers"*.

Teacher D: *"I emphasize what children did in the classroom and help the children to use the mouse correctly."*

Teacher E: *"I operate the computer and emphasize the instructions"*.

4.3.3 Computer usage in the classroom

Classroom observations showed that most of the children use computers in the head teachers' offices, in the computer lab and a few in the spare classrooms. There was only one school which placed the computers in the children's classroom. In many preschools (70%) computers were not adequate, looking at the ratio of 40 children per computer in one preschool as an example. It was noted that in that preschool children did not use the computer but observed the teacher and answered the questions from the teacher during computer lesson for one hour (the teacher used computer as a teaching aid). In one school there were seven (7) children per computer where children were attending the computer lesson and used the computer in turns for 20 minutes each group. In another six schools there were 4 children per computer and a group of children used computer for 5 minutes only in all the six schools. Besides this, other children in other preschools used computers for 20 to 30 minutes per group. Only one school was observed with the ratio of 1 to 2 children per computer and the children spent 10 minutes using a computer. There is similarity in data observed and what teachers reported with regard to the number of computers in preschools and the number of children per computer. Although teachers'

responses and researcher observations differed since it was observed that time mentioned by the teacher as taken by children were for the whole group and not for the individual child.

Teacher's time table showed that there is computer lesson for three days in a week in seven preschools. Whereas the preschool teacher's lesson plan showed that there will be a computer lesson, some preschools (three preschools) did not plan for a computer lesson at all.

4.4 Computer programs used in preschools

The researcher wanted to find out the computer programs used in preschools. The preschool heads through a questionnaire responded to the statements in Table 4.4.1. Teachers were interviewed and notes taken then lesson observation was also done.

4.4.1 School heads' responses on computer programs used

Table 4.4.1: School heads' responses regarding computer programs used

Item	SA	A	D	SD
Children and teachers access Internet.	2(20%)	2(20%)	1(10%)	5(50%)
I buy necessary computer programs for children's use.	3(30%)	4(40%)	2(20%)	1(10%)
Government assists us with funds to pay for resources such as Internet.	1(10%)			9(90%)

In the above Table 4.4.1 the majority of the participants (60%) indicated that children and teachers did not access the internet but the remaining 40% of the respondents indicated

that children and teachers do. The majority (70%) of the school heads indicated that they buy necessary programs for children's use while the remaining 30% indicated that they did not buy computer programs for children's use. The results indicated that mostly (90%) of the preschools did not get any assistance from the government in terms of funds to pay for Internet services while the remaining 10% of the school head indicated that government availed funds for them to pay for Internet services.

When responding to the open-ended questions two head teachers mentioned that their preschools provide adequate computer programs. One (1) gave a list of programs available for use by her children as follows; *Birchfield soft ware series, Key kids and the learning company and windows paint brush, Educom, Reading Journey, Maths Journey and Wide Eye* programs respectively. Another head stated that they do not have enough computer programs due to lack of money hence they use 'Lets read and play' only. The rest said they do not know the names of programs and their adequacy.

Another preschool head wrote:

"We are not able to provide computer programs for each child because our computer lessons are optional extracurricular activity and there is an extra cost for them. I do not know the programs available."

It is interesting to note that seventy percent (70%) of the teachers agreed that they provide the computer programs, but when asked to list them down in an open ended question majority (60%) said they did not know them.

4.4.2 Teachers' responses on computer programs used

To get computer programs used in the preschools the researcher asked the following questions during the interview; *Name the computer programs that are used in your school. Is the Internet always available when there is need for integration?*

Teachers from different preschools indicated that they used a wide array of computer software. The computer software were grouped and listed as: Windows Paint Brush, Click It, Educom Reading, Future Kids, Wide Eye Program, Jump Start Software, Birchfield Software Series, and Ace Monkey Program.

In one preschool the teacher said,

"I have access to the Internet when there is need to integrate".

The remaining nine teachers stated that *"they did not have Internet in their schools"*.

The researcher observed that school heads have a comprehensible understanding of computer software except a few who indicated that they did not buy computer programs for preschool children. Results on observation made by the researcher indicated that the Internet was non-existent in all the preschools except in one school where the Internet was solely used for office related matters.

Nevertheless, during lesson observation it was noted that both preschool teachers and computer teachers used a wide array of computer software. In different preschools the computer programs were verified as the same ones already mentioned by the teachers, for instance: Educom Reading, Jump Start Software, and Birchfield Software Series.

4.5 Level of developmental appropriateness of computer programs

The researcher wanted to find out whether the programs used were developmentally appropriate to the children's ages, individual capability as well as their culture. The results are reported in Table 4.5.1 below:

4.5.1 School heads' responses on level of developmentally appropriateness

Table 4.5.1: School heads' responses on level of developmentally appropriateness of computer programs

Item	SA	A	D	SD
I have an idea about developmentally appropriate program.	2(20%)	5(50%)	3(30%)	0(0%)
Programs used are developmentally appropriate.	5(50%)	2(20%)	2(20%)	1(10%)

The results in Table 4.5.1 above indicate that most (70%) of the school heads showed that they have an idea about developmentally appropriate programs. The remaining thirty percent of the participants indicated that they did not have an idea about developmentally appropriate programs. A large number (70%) of school heads said the programs used in the preschools were developmentally appropriate, whilst the remaining thirty percent (30%) indicated that the programs were not developmentally appropriate to preschool children. However, they did not mention the appropriateness in terms of specific items regarding age, individual ability or culture of the children.

4.5.2 Teachers' responses on level of developmental appropriateness of computer programs

When answering the research question which intended to investigate developmental appropriateness of computer programs the following question was asked: *Who is responsible for providing computer program?* Thirty percent (30%) computer teachers said that the programs were provided by the company that hired them to teach computer programs to the children. Another three preschool teachers (30%) said they tell their head teachers who then buy programs. The remaining forty percent (40%) said the programs are provided by the school owners. The teachers were asked to tell if the programs used were relevant to Botswana culture and if the programs were developmentally appropriate to the preschool children's ages and culture. Most teachers (70%) said that the programs were not culturally appropriate especially looking at the pictures used in the programs. Teachers gave a list of pictures used which are not relevant to Botswana like; *flowers, spider, fog and hurricane*. Otherwise some teachers felt the programs were developmentally appropriate to children with respect to age and individual capabilities.

4.5.3 Observation of developmental appropriateness of computer programs

The observation made by the researcher while searching for the programs installed in the computers revealed that some of the computer programs (Educom Reading, Wide Eye Program, Birchfield Software Series and Jump Start Software) used were found to be socio-culturally appropriate since they depicted transportation, mathematical concepts and park animals.

However, there were instances where programs used were divorced from the children's socio-cultural experience in their content for instance, topics on weather included concepts like fog and hurricane which is not relevant to Batswana context. In some preschools (30%), the researcher realized that the computers were not correctly placed at the level of preschool children. The computers were mounted at adult's level on desks used for office work. Most of the children had to crane their necks while some even had to stand up in order to see what was on the monitor.

Some of the computer programs (Click It and Future Kids) used seemed not to be developmentally appropriate for preschool children because the language used such as yacht, dinosaurs, dragon, ocean, just to name a few was above the scope of the learners. The speed at which the computer program was delivered appeared to be very fast for preschool children hence not all preschoolers managed to follow.

4.6 Computer integration in the preschools

The above heading arose from the research question number 4 "are teachers integrating computers in the learning of preschool children?" This research question intended to find out if there was computer integration in preschool learning or not. The following statements were used and they were answered by the school heads in Table 4.6.1.

4.6.1 School heads' responses on computer integration

Table 4.6.1: School heads' responses on computer integration

Item	SA	A	D	SD
It is the teacher's responsibility to integrate computers.	4(40%)	2(20%)	1(10%)	3(30%)
Integrating computers in learning is a waste of time.	1(10%)	1(10%)	1(10%)	7(70%)
Children do not benefit anything from computer integration.	1(10%)	1(10%)	1(10%)	7 (70%)
Total	6	4	3	17

The school heads responses shown in the above table (table 4.6.1) indicate that sixty percent (60%) feel that it is the teachers' responsibility to integrate computers when teaching, the remaining forty percent (40%) did not agree with that statement. Then eighty percent (80%) of the respondents indicated that computer integration was not a waste of time and that children benefited from computer integration. A small number of heads (20%) agreed that computer integration is a waste of time; they also feel that children do not benefit from it.

4.6.2 Teachers responses on computer integration

During the interview in order to establish the person responsible for providing the computer programs the teachers showed that some preschool heads (those who owned computers) buy computer programs for the preschool. In those preschools, all preschool children have an opportunity to use computers. On the other hand in some preschools computer companies are given the permission to offer computer lessons. The computer

companies provide computers as well as computer programs of their choice to preschool children.

Earlier teachers stated that the computer is placed in the head teacher's office. As such the computer lesson is taken as separate activity. These teachers are aware of computer integration but are not in a position to implement it due to hindrances such as shortage of computers and programs relevant for integration. Some teachers did not have a plan for a computer lesson. In those preschools where teachers did not plan for the computer lesson, one teacher stated that:

"I do not plan for the computer lessons because not all the children attend computer lessons. The children who are doing computer lessons are those whose parents managed to pay an extra fee for the computer lessons".

Nevertheless some teachers (30%) showed that they integrate computers in the learning of preschool children through programs that provide room for integration like; "Alphabets, Animals, Numbers, Weather and Stories they read and heard". These are the teachers who plan for computer lessons in their preparation book.

4.6.3 Computer integration observed

Lesson observations substantiated the above findings that few teachers were the ones responsible for computer integration where the topics they were teaching provided room for integration. Lesson observation showed that integration of computers across the curriculum is hampered by a number of problems such as computers placed in the offices, inadequate computers, non-existent Internet services, computer programs not designed in

line with the preschool curriculum, private companies teaching computer lessons independently from preschool curriculum and computer illiteracy amongst school heads.

4.7 How the programs are integrated in the curriculum

4.7.1 Preschool heads responses on how computer programs are integrated

The last research question intended to find out how school heads in the preschools integrate computer programs in the learning of children. Since the school heads did not teach computer lessons basically they were to show whether they promote integration of computers through monitoring teachers or assessment of teachers for integration. One of the items in the questionnaire for the preschool heads sought to establish if there was any form of assessment done to ascertain whether teachers integrated computers across the curriculum or not. The results indicate that there were no mechanisms or policies put in place by school heads to ascertain the teachers' level of computer integration across the curriculum. The minority of head teachers (30%) said they never assess teachers when they were asked to state any form of assessment done to check if teachers integrate computers across the curriculum. When asked to give reasons they wrote:

“Computer lessons are solely for the company that made agreement with the preschool to carry out computer lessons. This makes it difficult for the school heads to monitor the level of computer integration across the school curriculum.”

Other school heads indicated that they do assess teachers for integration. When answering the question how they assess them one school head wrote:

“Computers are core to our curriculum. Planned themes have specific programs to go with, hence assessment is done almost on daily basis.”

4.7.2 Teachers responses on how computer programs are integrated

The research question number five which read “how are the programs integrated in to the curriculum?” was addressed by interview questions for teachers and computer teachers: *How do you integrate computers when teaching? What are the problems encountered when integrating?* The teachers who integrated computers gave different responses as expected:

Computer Teacher A: *“I plan together with class teacher, and then integrate the theme that is done at the class during the computer lesson”*

Computer Teacher B: *“Computer programs go hand in hand with syllabus so what children do with computers is what they have already learned in class but now they do it again as fun.”*

Preschool Teacher C: *“Children write their names and letters of alphabets using key board. They paint shapes in different colours in a way emphasising the themes covered during theory lesson.”*

Preschool Teacher D: *“My school has books, CD-ROM, cassette and video cassettes which I use to teach children. The children watch the stories in the Television, and then use CD-ROM to work on activities related to the story they heard or watched. The example of such program is Birtch Filled.”*

Preschool Teacher E: *“I integrated themes like; numbers, weather, farm animals, transport and wild animals. I stated that after teaching those themes in a lesson I then take children to a computer lesson to emphasize the topics by giving children an activity in a computer that is related to that theme.”*

Probably preschool teacher B who indicated that computer programs in their school go hand in hand with their syllabus was just overstating the facts.

Other teachers' responses showed that they do not integrate computers, by giving the following responses:

Computer Teacher A: *"I teach separately from the class teacher curriculum. I build on what I taught previously."*

Preschool Teacher B: *"I encourage children to say the words after the narrator so that children build their vocabulary."*

Some teachers (30%) stated that they encounter problems when trying to integrate computers. They were probed to come up with problems and they stated problems such as:

- No access to the internet
- No computer programs relevant to Botswana
- Children without computers at home are less computer literate and as such lag behind. However those with computers at home finish tasks much faster and get bored while waiting for their turns to use the computer
- Large groups of children per computer contribute to slow learners not coping instead they feel frustrated.

Other teachers stated that they are not trained for preschool children but they are trained for computer applications only. This makes it difficult for them to integrate or control children. One teacher even said:

“Children do not know how to use key board and the mouse. The children also have language problems since one child calls computer ‘Poncuter’ instead of saying Screen the child would say ‘ice cream’.”

4.7.3 Integration of computer programs observed

During lesson observation no integration was observed. Some teachers took the children especially those who paid for the computer lessons from different classes to attend a computer lesson. These teachers followed the computer program by continuing where they stopped. Other teachers introduced the computer (mouse, key board, screen and monitor) to the children and opened a Microsoft program called paint brush for children to start painting shapes. Large groups per computer contributed to less time given to some learners who became impatient and unoccupied. It was also evident that children were frustrated due to chaotic classroom atmosphere during computer lessons while children waited for their turn to use the computer.

Classroom observation showed that most teachers failed to control the children during the computer lesson. This observation did not prevail in one preschool where the teacher used one computer with the rest of the children in preschool class at a time. During that computer lesson the time taken was too long (one hour) as the children were tired and did not concentrate.

4.8 Discussions of the findings

4.8.1 Types of preschools and respondents demographic information

It can be deduced from this data that private individuals operate most of the preschools. The time has passed since Bose's (2005) research, but still most preschools are still operated by private individuals. Operation of preschool by private individuals is advocated in the ECC&E policy (Republic of Botswana, 2001a) which emphasizes that any person interested in operating the preschools should be given the opportunity to do so since the government is not yet ready to provide such services. So people went on to open private ECC&E centres, even without a background of ECC&E.

Demographic data of the participants showed that most of the teachers in preschools are females while male teachers are very few. This is interesting since Bose (2008) also made a similar observation that majority of preschool teachers in Botswana are females. The majority of preschool teachers are middle-aged women. The youngest participant was the male teacher, who might be in the program due to escalating unemployment rate in the country. Therefore he might leave the department of early childhood education if he finds a suitable job for his qualification (certificate in webpage design). The results show that only one school head is qualified for the area of preschool education operation.

During the interview session the researcher found out that those preschools without computers used private companies to teach preschool children computer lesson. The private company's computer teachers were not trained in ECE at all. Bose (2005) also made a similar observation that in five preschools, children were taught by qualified

computer teachers yet not trained in ECE. One may therefore assume that ECE training for preschool teachers still lags behind since majority of preschool teachers are not trained in ECE according to the results. The study carried out by Landerholm (1995) on early childhood teacher computer attitudes, knowledge and practices found out that kindergarten teachers had positive and professional attitudes towards using computers. Preschool teachers who offer computer lesson to children show a sign of positive attitudes towards use of computers. It is assumed that this is not so in some Botswana preschools (three preschools) which participated in this study, more especially those preschools that provide computer lessons but do not own computers, computer programs or computer teachers. Therefore, this may raise the question in mind about computer integration due to lack of computer literate preschool teachers who trained in ECE. Preschool children need well trained teachers who have acquired relevant skills for preschool education for example both ECE and ICT training. Lack of trained preschool teachers with ICT skills may be due to the fact that government does not assist preschools with funds so preschool heads end up employing any available person prepared to get any salary.

It was also discovered from the researcher's observation that the school heads are the ones with more experience than preschool teachers with regard to preschool teaching. One can assume that the reason why there are more graduates who are less experienced (less than 5 years) in the preschools is that they are doing it as a part time job while looking for employment in other sectors that they qualify for.

4.8.2 Research question 1: Are teachers using computers in the learning of preschool children?

The results from the study show that there is computer usage in the preschools looking at the preschool heads responses. When looking at the responses given by the teachers during the interview, one can say that there is computer usage in preschools, since the teachers showed that they access them from different places such as school heads offices, computer lab, preschoolers' classroom, or spare classroom. Some teachers mentioned that children use computers at home and these children make fast progress during computer lessons. A similar observation was made by Plowman and Stephen (2003) that children use computers at home and when there is parental guidance children benefit a lot from computers. Therefore one may conclude that there is progress in Botswana since there is evidence of computer usage in all the preschools sampled.

Certainly these preschools are doing a good job by making an effort to try as much as possible to provide computers for preschool children, as it is found out that computer and video games were becoming increasingly present in young children's lives in the United States, where seventy percent of children between the ages of four and six have used a computer (New and Cochran, 2007). The studies reviewed show that computers are vigorously used for various purposes in the learning of young children and that, teachers and parents played a major role in providing and determining the use of computer by preschool children. In that case there are similarities in the present study findings and the New and Cochran (2007) study findings.

One can assume that in some years to come computers will be available in all preschools and parents likewise will have an input in their children's learning of computers. The use of computers evident in preschools is a good attempt since children work cooperatively in groups, and therefore develop language skills. Working in groups also encourages children to develop positive self esteem and social skills while working cooperatively with others as advocated by Jackman (1997). Facer, Furlong, Furlong, and Sutherland (2001) also made similar observation that despite the low ratio of computers to students, some critics feel there is lack of quality software and that technology is too complex, and that preschools put computers in a single room where children use them once a week under a teacher's supervision.

In some preschools computers were used once or twice a week and teacher's responses clearly show that they monitor children's use of computers. Seventy percent of preschool heads outlined that in their preschools, teachers had computer skills. This may be true because most teachers used in the research are graduates, who perhaps have been exposed to ICT during their training program. It is clear that some preschool teachers had computer skills and were able to use the computers according to their plan. Therefore, computer usage was evident in preschools except in one preschool where computer was used as a teaching aid by the teacher during computer lesson.

4.8.3 Research question 2: What computer programs are used in the preschools?

The results show that both preschool and computer teachers used variety of computer software. Different preschools used different programs for teaching preschool children

computers. Dodge and Colker, (1998) indicated that program like Mirroring can be used by children to arrange blocks in new shapes and designs. Even though mirroring was not one of the programs used the futures of the program are similar to the programs used by some teachers like Birchfield Software Series where children used parts of an object to make a picture.

Looking at some of the school heads responses that they buy computer programs for preschool children, the implication is the school heads make life difficult for preschool teachers handling such classes. It means preschool teachers in this situation are not given opportunity of choosing programs suitable for their subjects. Some preschool heads indicated that they have Internet services available for children use, contrary to preschool heads results, the researcher's observation notes showed that Internet was non-existent in all the preschools except in one school. In that particular preschool the Internet was available in the head teacher's office while computers used by children in the classroom were not connected to the internet. The Internet was solely used for office related matters. This differs with Morgado et al. (2007) study, which showed that programs like ToonTalk are available for children on the Internet and it was found that such programs create positive motivation for the development of the children. Therefore, one may conclude that children are denied opportunity to learn through the Internet hence hindering their positive motivation for development.

The National Council of Teacher of Mathematics (NCTM) document (Republic of Botswana, 1999b) advocates for the use of Internet as an important instructional and non-

instructional component of teaching/learning process. The findings of this study showed that the government does not avail funds for Internet connection services in preschools. Bose (2008) made a similar observation that even if the policy has been long formulated the implementation of policy contents is still not functional. This means it will take some time for government to fully see to it that preschools provide quality education.

4.8.4 Research question 3: Are the computer programs used by teachers developmentally appropriate?

Some of the computer programs used by the teachers were developmentally appropriate to the child age, and the child capability but not socio-culturally appropriate according to teachers' responses. The observation made by the researcher revealed that some pictures used and some words used in computer programs were not relevant to Botswana context and were above the level of preschool children, such concepts neither did not meet the age-developmental level nor relevant to socio-cultural of the preschoolers. This is a contrast looking at the statement that reads computer programs must reproduce cultural reflection so that children develop skills and knowledge which relate to the socio-cultural aspects and on the other hand are relevant to the given age (Evans, Myers, & Ilfeld, 2000). The findings do not reflect that teachers offer children developmentally appropriate exploration of concepts through hands-on activities with concrete materials as advocated by (Essa, 1999). The use of concrete materials in activities in conjunction with computers helps children to learn in a quite interesting and challenging manner since computers offer experiences that build on their explorations.

Therefore, since preschool teachers in this study were mostly not qualified for ECE program they may fail to identify developmentally appropriate programs. For instance in some preschools the computers were placed on adults size desks. This finding is not in line with DATEC guide for best computer application which perhaps can be beneficial for preschool teachers to follow. DATEC guiding materials for early childhood educator outlined that best application for computer programs should: educate, encourage collaboration, support integration and play, be left in control of the child but be careful to avoid violence as well a stereotyping, and also support the development of an awareness of health and safety issues and involvement of parents (Siraj-Blatchford & Siraj-Blatchford, 2007). Teachers need to follow all of these guidelines in order to provide a beneficial learning environment for preschool children during computer lessons.

4.8.5 Research question 4: Are teachers integrating computers in the learning of preschool children?

The results showed that children in the same preschool are not provided same services. Some preschool heads are neither trained in ECE nor ICT, yet showed that they provide computer programs to their own preschools. Some preschool teachers do not prepare for computer lessons. All these imply that whether there is computer integration or not in the learning of preschool children the teachers and preschool heads are not concerned. Some teachers from private companies said, “We do not know what the preschool is teaching, we are only responsible for teaching computer program to children who subscribe to our program”. Therefore, in a situation like this, it is not easy to say there is computer integration.

The heads who indicated that it should be the teacher's responsibility to integrate computers in the learning of children gave a fair answer since according to the researcher it should be so because the teachers know the school curriculum best, know ages of the children best, they know best their individual capability hence they can choose programs relevant for integration rather than integrating some topics. There are similarities to Garegae's (2003) findings that teachers think computer integration is appropriate for Mathematics and Science subjects only by just looking at the examples of topics teachers listed as the ones they integrate (Alphabets, Animals, Numbers, Weather). Also studies affirm that there are benefits which increase through integration such as incorporating positive racial idiosyncrasies, and helping students to develop the skills, knowledge and abilities associated with a given age (Wilson, 2008; Hilliard & Pine, 1990; Evans et al., 2000).

The results showed that there is knowledge of importance of computer integration amongst teachers and heads though this is not implemented. As such that contrasts Glass in Garegae, (2003) where he said if computer is used to its fullest potential it can be used at all level and for all the children. Preschool teachers should fully utilise the computer by integrating it throughout the curriculum themes in a way fostering child development. This can be possible if preschool teachers and teachers from private companies work together to decide on the themes to be integrated during computer lessons.

4.8.6 Research question 5: How are the programs integrated into the curriculum?

According to preschool heads there are no strategies used in order to determine the computer integration in the learning of preschool children. This is so because the

computer lessons are operated by the company that provide computer services. The implication is that, some preschool heads do not provide computers and computer programs in their preschool while in some schools, heads leave computer integration to the teachers.

The data revealed that it is not possible to say that there is computer integration across the school curriculum, given that a computer is taught as a separate subject and in addition regarded as some form of “free play” in some schools. So the researcher is bound to conclude that the aspect of how computers are integrated was hindered by a number of factors. This contrasts statement that reads when teachers show positive attitudes towards computer usage and integrate it in diverse activities like including it in a learning centre in a classroom, children respond positively to the tool (Essa, 1999). As such children’s independent learning is fostered.

The data clearly shows that computer integration is not that effective as it is not aligned to the school curriculum mainly because the programs used by teachers were of a higher level to the standard of the children and are not content and context specific to Botswana which makes it difficult to contextualize teaching. For example, the “Ace monkey” features concepts, which revolve around oceans and seas that are not context specific to Botswana. There is a dearth of computers in preschools, which makes it difficult to integrate computers given the computer-student ratio as mentioned above. Computer lessons come with an extra fee, which disadvantages children who have not paid for such lessons hence creating learning differences amongst children in the same preschool.

There was some evidence that supported the positive influence of computer usage as a learning tool for children at preschool as compared to traditional teaching of skills. Children who used computer assisted instruction developed positive attitude and increased attention span (Vernadakis, et al., 2005). However, in one school, children did not even have time to use computers, instead they observed the teacher operating the computer for one hour while they were expected to answer the questions based on what the teacher was doing on the computer. The purpose of computer integration is lost this way. A study carried out by Lynch and Warner (2004) indicates that computers were used regularly in child care facilities to extend concepts learned. Contrary to these research findings, observations of this study revealed that computers were not used to extend concepts regularly in preschools. Preschoolers would use the computer for five minutes at the maximum once a week without any introduction relating to concepts learned. The problems such as inexperienced teachers, untrained ECC&E teachers, and absence of computers may be the contributing factors to failure in computer integration across the curriculum.

4.9 Summary of findings

The findings addressed the following research questions; do teachers use computers in the learning of preschool children? What are the computer programs used by the teachers? Are the computer programs used for integration developmentally appropriate? And how the computer programs are integrated in to the curriculum?

When answering the first research question the results showed that teachers use computers in preschool learning. The other research question was to find out computer programs used by preschool teachers and the results are that, a number of programs such as Ace monkey interactive program, Jump start software, Birchfield software series, Click it, and Future Kids were observed. The research question which was designed to find out the developmental appropriateness of the programs to preschool children showed that most of the programs were not developmentally appropriate to the learner's age and cultural context.

Also there was no integration of computers across the curriculum due to limited number of computers in the preschools and inaccessibility of other important innovations like Internet. The other research question intended to find out how the teachers integrate the programs when teaching young children. The results indicated that those teachers that integrate computers in preschool learning integrated mathematics and science orientated themes only, such as numbers, animal, and weather by emphasising what was learnt theoretically during the computer lesson.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

In Botswana, Government regards children as its most valued resources. In that regard programs like Early Childhood and Care Education are in place for their protection and nurturing (Republic of Botswana, 2001a). Therefore preschools play a major role in nurturing of children. The study 'Use and extent of computer integration in the learning of preschool children in Botswana' was carried out in order to see if really children are nurtured accordingly. The study indented to find answers to the following questions; are teachers using and integrating computers in the learning of preschool children? Programs used by teachers and their relevancy to Batswana children, as well as how teachers integrate the programs? The researcher encountered a number of limitations such as electricity shortage in Botswana resulting in schedule failure and making of new appointments as such prolonged data collection period since the computer lesson needs electricity to be carried out.

Literature reviewed shows that majority of preschool children use computers worldwide. Studies revealed that children begin using computers in child care centres between age two and four years regardless of socioeconomic status (Lynch and Warner, 2004). Computer integration proved to develop children's positive self-esteem and social skills. A study carried out by Vernadakis, et al. (2005) showed that computer integrating proved to be the best strategy for higher results it produces and long attention span it creates.

The research methods used in order to answer the research questions were both qualitative and quantitative. The study comprises of ten preschools in Gaborone which were selected using purposive sampling. The data were collected with the help of self-administered questionnaire for preschool heads. Preschool teachers responsible for computer lessons were interviewed and observed.

The results of the study were presented and discussed where coding was employed. The first theme was to answer the first research question, “are teachers using computers in the learning of preschool children?”

- The results show that teachers use computers when teaching preschool children. The ratio of computer to child ranged between two children per computer and five children per computer. In some preschools computer were placed in heads offices. This is due to limited number of computers in the preschools. The implication is that the school heads and preschool teachers are aware of the significance of the role of the computers in children’s education.

The other objective was to find out computer programs used by preschool teachers.

- It was found that, there are number of programs used such as Ace Monkey interactive program, Jump Start Software, Future Kids, Birchfield Software Series and Click It. None of the programs used were accessed through the Internet which imply that teachers feel children cannot use Internet. The other implication is preschool heads do not have money to pay for Internet services.

Are the computer programs used developmentally appropriate for the preschool children of Botswana? Was one of the research questions and the results showed that,

- Some of the programs were developmentally appropriate to the learner's age but not culture according to preschool teachers. During the lesson observation language used and the speed of delivery of some programs were above children's age. This was because the computer software were bought by the school heads and computer teachers who do not teach computer lessons they were brought and provided by the outsourcing companies who did not know the contents of the preschool curriculum. The implication is outsourcing companies are more interested in making money than providing better education or relevant education to the children.

The other research question; whether there was integration during computer lesson, and the findings are,

- The issue of computer integration is non-existent in most preschools due to a number of reasons: teachers continued computer lessons from where they stopped in a previous lesson instead of infusing theory lessons; inaccessibility of other important innovations like Internet; number of factors contributed to hindrances of computer integration like outsourcing companies working independently in teaching computers to preschool children and large number of children per computer. Other problems included non-involvement of preschool head. The

implication is head teachers and teachers do not want to be accountable for computer integration may be they take it as an overload.

The last question sought to find out how the programs are integrated in the curriculum of preschool children, the results showed that.

- Teachers who integrate use few programs like weather and numbers. This is contrary to the literature which showed that integration can be done across the curriculum with help from the Internet and computer used as free play. Lack of trained ECC&E teachers contributes to failure of computer integration. The implication is that teachers assume that computer integration is for mathematics and science only.

5.2 Conclusion

The study investigated the use and integration of computers in the learning of preschool children and found that there is computer use, whereas integration of computers was not evident due to limited number of computers in preschools. Fortunately, government recognizes the importance of learning of preschool children, hence makes an effort in order to improve their education. Information and Computer Technology (ICT) plays an important role in global technological era and as such should be seen as a need in the learning of preschool children (Bose & Tsayang, 2005). Therefore computer use and integration is a very important and valuable new innovation and hence this issue needs further research for the betterment of the citizens of the country.

5.3 Recommendations

The recommendations below are made in accordance with specific concerns that have emerged from the findings of the research. Moreover it is imperative that there should be more studies carried out on the subject specifically on the integration part. The study also unearthed very important issues which have implications for policy makers, training institutions, teachers, parents and future researchers. It is therefore imperative that the following recommendations are implemented forthwith.

Policy Level

- Government should design a preschool curriculum which is ICT oriented. Such curriculum would enable easier implementation of Government policy on ICT at a preschool level.
- Government and schools to engage with NGOs in a partnership to provide computers and internet to preschools.
- The Ministry of Science Communications and Technology together with Ministry of Education and Skills Development should collaborate and provide computers to preschools.

Curriculum developers

- Teachers knowledgeable in ECC&E and the curriculum should liaise with computer software engineers in order to have relevant software developed.

- Funding should be made available to guarantee tapping on internet services at preschool level.

Training Institutions/ Teachers

- Seminars and in-service training which involve the University of Botswana and other training institutions should collaborate in training of ECC&E teachers. Such kind of effort would actualize the use of computers in preschools.

Future Research

- When funded by government the researcher should explore as many preschools in Botswana as possible.
- Future research to further explore dimensions of this study such as, computer integration, teacher preparation on ICT for preschoolers and structural problems limiting the use of computers in preschools. With data yielded from such kind of studies, definitive conclusions could be made about the use of computers in preschools.

The study is an eye opener to all the preschool stakeholders. As such they will see computer integration as an important innovation and introduce computers at preschool. It might also help them in preparing children towards a global world of computer literacy. Children who use computers might be able to build on what they learnt while at preschool rather than viewing a computer as a new tool in upper grades. Perhaps, if computer integration can be taken more seriously it would help them to improve their performance.

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Appendix A

Questionnaire for head teachers

The following are questions on a study designed to find use and extent of computer integration in the learning of preschool children. Your response in this questionnaire will help in providing useful information for this study.

Section A

Tick where appropriate

Gender: Female

 Male

Highest teaching qualification (Specify):

 Untrained

 Certificate

 Diploma

 Degree

 MED

AGE: 21-25

 26-30

 31-40

 41 and above

Teaching experience: 1-5

 6-10

 11-15

 16 and above

Type of preschool: Community based

 Private

 Mission school

 NGO

 Orphan care centre

 Council

 Institutional

SECTION B

Please respond to all questions using a tick on the options you feel you agree with.

Item	Strongly agree	Agree	Do not know	Disagree	Strongly disagree
My centre has enough computers.					
The ratio of number of children per computer is proportional.					
Computers is used every day by children.					
Children and teachers accesses internet frequently.					
I buy necessary computer programs for children's use.					
I do not have an idea about developmentally appropriate programs.					
It is the teacher's responsibility to integrate computers when teaching.					
Computer integration does not provide multi cultural learning.					
Government assists us with funds to pay for facilities such as internet.					
Integrating computers in learning is waste of time.					
Children do not benefit anything from computer integration.					
Teachers in my preschool are well equipped with computer skills.					

Section C

Please provide honest answers to the following questions.

1. Does your preschool provide adequate computer programs? Yes [] No []

a) If your answer is no what are the hindrances?

2. List the computer programs available for use by children.

3. Did you notice any difference as per performance or developmental skills since the introduction of computers in your centre? Yes [] No [] Please give reasons.

4. Are the computers placed in the computer lab or in the classroom? Give reasons for such position.

5. Is there any form of assessment done to check if teachers integrate computers across the curriculum? Yes [] No []

a). If the answer is no why?

b). If your answer is yes, what strategies do you use?

6. Do you offer sponsorship to teachers willing to upgrade their computer skills? Give reason to your answer. _____

Teacher's computer skills and qualifications _____

Time spent by child on the computer _____

Role of computer integration

Section C

a). Who is responsible for providing computer programs?

b). Are the programs developmentally appropriate?

c). List the developments observable when children work on computer-integrated themes.

d). Give examples of software that you integrate mostly and reasons.

e). Is it possible for you to integrate computers across the curriculum?

f). Do children work independently in computers or you provide intensive monitoring?

g). Is the internet always accessible when there is need to integrate?

h). What culture does the computer programs promote?

i). State the challenges of computer integration in learning of the young children.

j). What can be done to overcome the problems that are normally encountered during integration of computers?

Appendix C**Observation guide for teachers**

Number of Boys ____ **Girls** ____ **Total** ____ **Per computer**

Number of working computers _____

Computer position and level of chairs

Ratio of computer per child is it proportional?

Do children work cooperatively as a group or they work individually

Curriculum used: does it provide for computer integration?

Lesson plan: any computer integration planned

Frequency of computer use included in the time table

Supervision during computer integration

Relevancy of computer programs to the

List of some things to be observed

Teacher competency _____

Organization of concepts during teaching

Availability of computer programs needed for integration that matches with curriculum

Is integration for some themes or across the curriculum?

Children capabilities in using computers

Children's interest in the computer program

Internet use

Problems identified during learning using computers.

Appendix D

**UNIVERSITY OF
BOTSWANA***A. FACULTY OF EDUCATION**B. Department of Primary Education*

Private Bag 0022 Gaborone Botswana

Telephone: +267 3552255

The Director,
Department of Primary Education,
Unit of Early Childhood Care and Education,
MOE, Private Bag 005
Gaborone, Botswana.

19th February, 2008

Dear Sir/Madam

RE: Request for permission to carry out research in preschools

The bearer of this letter Chabuya Kadisa, ID. No.200300511 is a second year Masters student in the university of Botswana. She is currently doing a detailed study on "Use and extent of computer integration in the learning of preschool children". I would like to request you to grant her permission to conduct a study in pre-schools and also access your reports and any other literature on the above issue.

Thanking you in anticipation.

Yours sincerely,

K. Bose
Senior Lecturer,
Department of Primary Education,
Faculty of Education, University of Botswana,
Tel: 3552891.

Appendix E**UNIVERSITY OF
BOTSWANA***C. FACULTY OF EDUCATION**D. Department of Primary Education*

Private Bag 0022 Gaborone Botswana**Telephone: +267 3552255**

The School Head,

29th February, 2008

Gaborone

Dear Sir/Madam

RE: Request for permission to carry out research in preschools

The bearer of this letter Chabuya Kadisa, ID. No.200300511 is a second year Masters student in the university of Botswana. She is currently doing a detailed study on "Use and extent of computer integration in the learning of preschool children". I would like to request you to grant her permission to conduct a study in your pre-school and also access your reports and any other literature on the above issue.

Thanking you in anticipation.

Yours sincerely,

K. Bose
Senior Lecturer,
Department of Primary Education,
Faculty of Education, University of Botswana,
Tel: 3552891.

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